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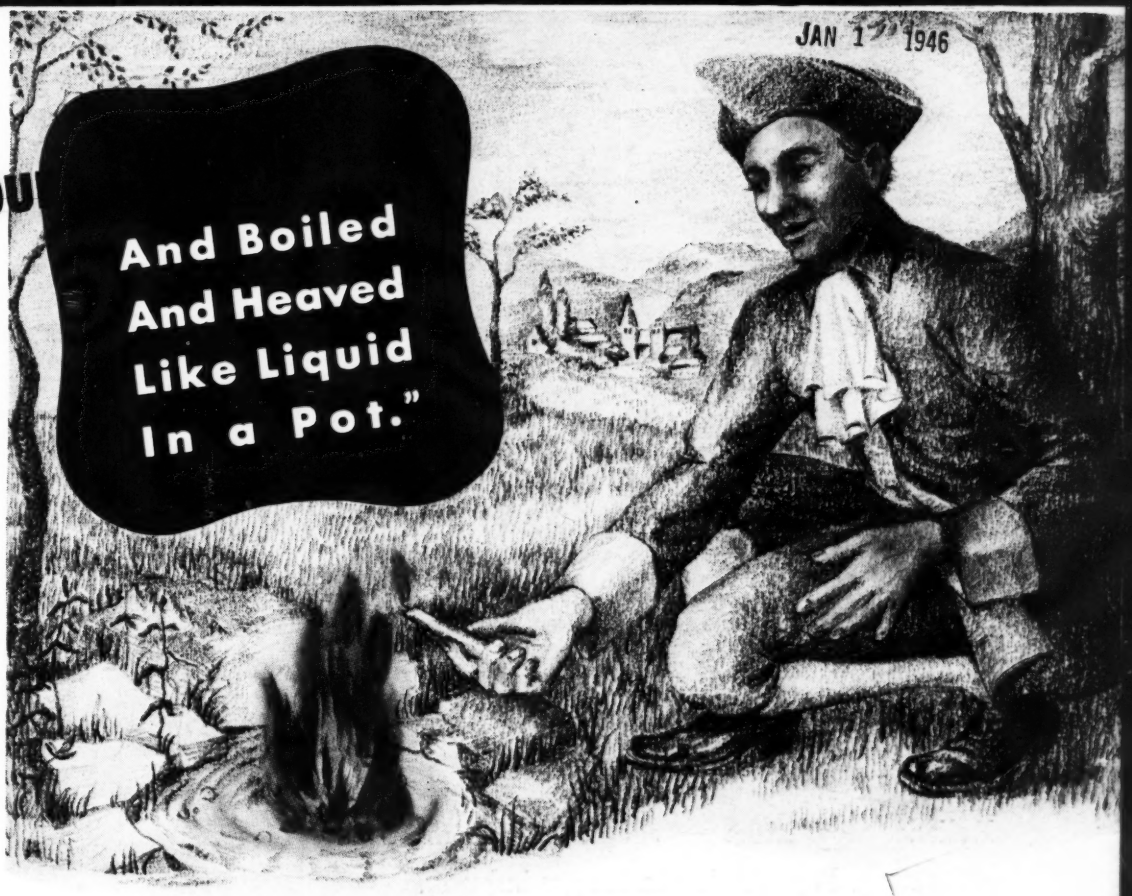

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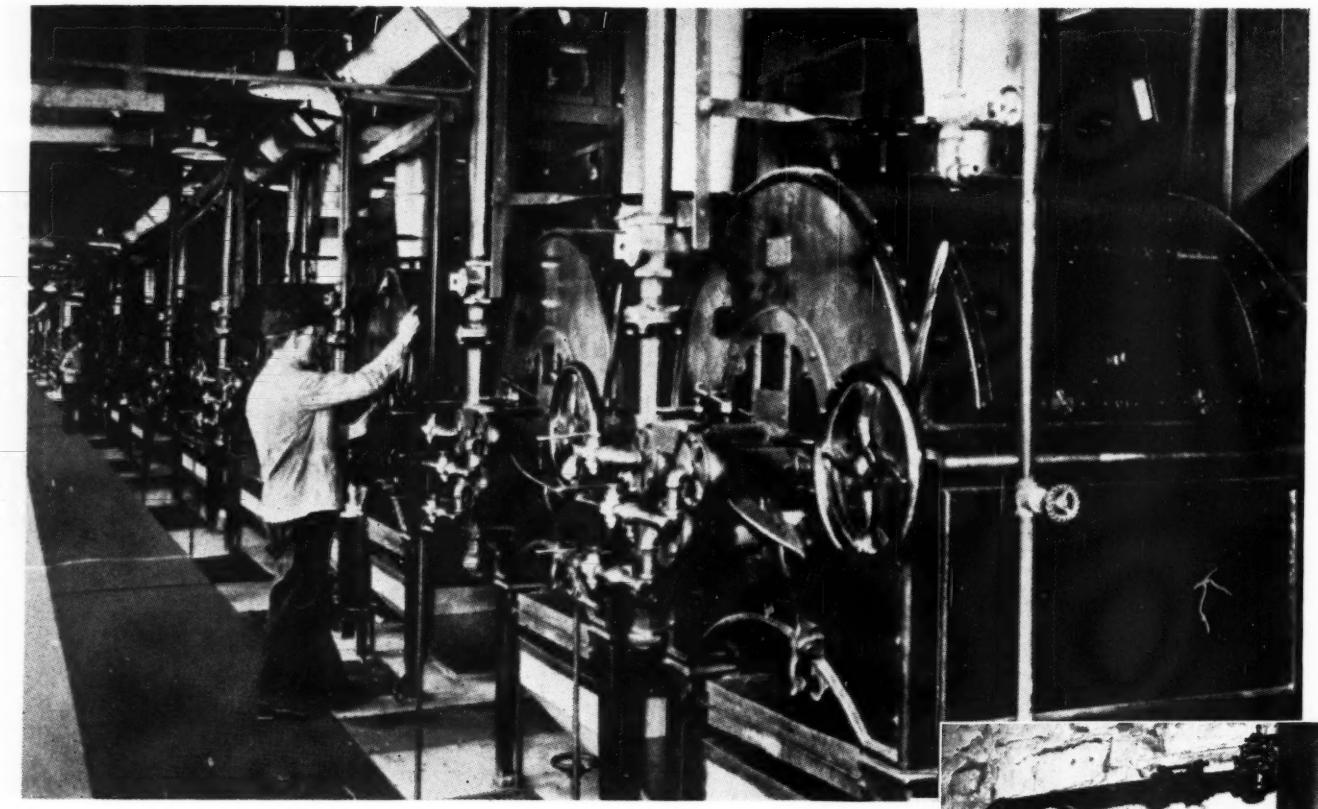

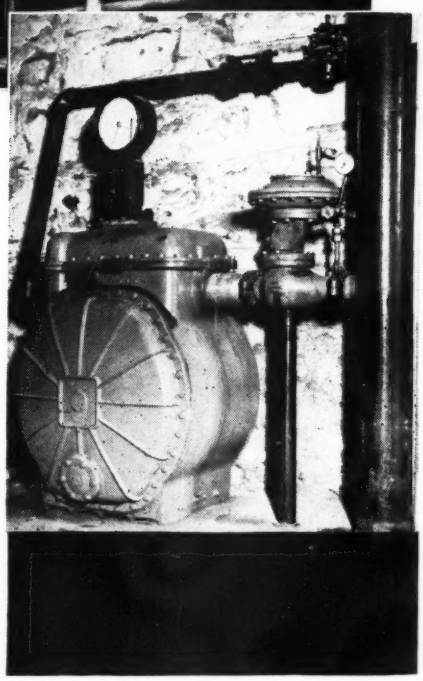

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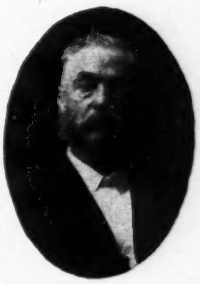

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Twenty-First Year of Publication

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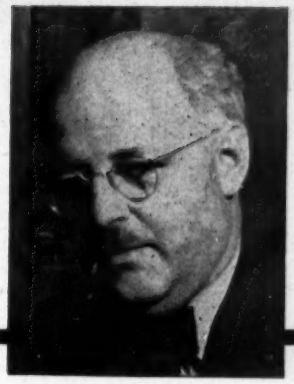
THERMALLY THINKING



By ELLIOTT TAYLOR, Washington Editor

FP Challenge

AS the Federal Power Commission proceeds with its Docket G-580 investigations, for the ostensible purpose of accumulating information to lay before Congress with recommendations for amendments to the Natural Gas Act, it is well to take note of the fact that the Commission is already amending the act by its own action, and without the slightest let or concurrence on the part of Congress.

Also of disquieting significance is the fact that in every instance in which the Commission has inched forward its jurisdiction over the end uses of gas,—an authority never contemplated or condoned by any congressional action,—neither the company affected nor any representative of the industry at large has risen to challenge the new viewpoint thus presented.

The Commission's recent order in the matter of the Northern Natural Gas Co. application (Docket G-533) represents a complete and final reversal in administrative policy toward direct sales of natural gas for industrial purposes. Northern Natural was denied its application to supply gas as a boiler fuel in a new installation at Boone, Iowa, and the use of gas was limited to standby facilities and as pilot lights on the coal burning installation. As a primary fuel, which was what the electrical generating company wanted when it built its new high compression boilers at Boone, natural gas is out. And the reason baldly stated by the Commission: *It would displace coal.*

The very tone of the order leaves no doubt that the Commission now regards itself as potential dictator of all the fuel industries and the present and finer arbiter of any jurisdictional disputes that may arise between natural gas and coal. It forecasts an early advance to the position where public convenience and necessity in gas matters will become a regional problem, capable of solution only in the light of its effect on competing fuels. Witness the language of the Commission's order of November 6, 1945, adopted by unanimous vote:

> "Although coal has been used satisfactorily during the existence of the Boone plant and abundant supplies of coal are available within a radius of 50 to 75 miles from Boone, Iowa, Iowa Electric proposes to use natural gas as fuel for the new boiler. The use of gas at the Boone plant would displace approximately 30,000 tons of coal annually."

In the light of this situation, so distasteful to the coal and railroad intervenors in the case, the Commission found that the proposed transportation and service of natural gas would not be required by either present or future public convenience or necessity.

It is indeed difficult to reconcile this airy arrogation with what must have been the state of mind of the Commission when, in its report to Congress in January of 1944 it stated:

> "It has been the unanimous view of the Commission that, inasmuch as the Congress had not given it comprehensive powers to deal with the end uses for which natural gas in consumed, and had granted the Commission no authority to regulate rates for the direct sales of natural gas to industry, it was the duty of the Commission not to seek to exercise such authority until the Congress amended the natural gas act to confer on the Commission such specific powers as Congress desired it to exercise."

The Commission probably had a pretty good idea already concerning the "specific powers that Congress desired it to exercise." As far back as 1940 it had requested Congress to extend its authority to cover sales of natural gas from interstate pipe lines for industrial as well as domestic and commercial purposes. But in the only amendment ever made to the natural gas act, that sponsored by Congressman Lea in 1942, this request was ignored. Apparently Congress was of the opinion that the Commission needed no further authority over end use. But if what Congress may have had in mind was anybody's guess and not susceptible to interpretation by so simple a process as plain perusal of the act itself, what the Commission now has in mind is more easily discovered, and it is emerging daily into ever clearer perspective.

What Congress failed to do, and what the FPC was unsuccessful in its attempts to have Congress do, was a dereliction by our lawmakers that is now being rapidly repaired by the new administrative tactics of the Commission. For in less than two years from the time when it officially and formally disavowed any jurisdiction over end uses, it has completely reversed that original position. In so doing it has left behind it a trail of orders and opinions in which end use prescriptions and prohibitions are the major if not the only certificate conditions.

Early in 1944, disregarding its own pious disclaimer of January, the Commission called upon New York Natural Gas Co. to submit evidence of the end uses to which the gas would be put if the company were permitted to build a 12-in. line across Pennsylvania. Then in an opinion handed down in April of that year, the company was given a limited certificate under which it was authorized to construct a line having a daily capacity of 50 million cu. ft., providing only 30 million feet or 60% of the capacity of the line was used. This uneconomic and harassing provision was designed to preclude the use of excess capacity for possible direct unregulated sales of natural gas to industrial users.

The limited certificate thus authorized could not have been regarded as anything but an experimental foray into a proscribed area of regulation by the Commission.

But if it anticipated a test case challenging its authority it waited in vain.

With this, the first scalp, hanging from its belt, the Federal bureau no doubt began to regard itself as on reasonably good fighting ground; now amply persuaded of that fact, it has been throwing its weight around ever since. In the past year and a half end use conditions have been attached to so many certificates that they have become the rule rather than the exception.

In November, 1944, the Memphis Natural Gas Co. (Docket G-522) was granted the hotly contested certificate that had originally been denied it by the Commission. The condition here was that the new facilities authorized should not be used for the transportation or sale of natural gas to any new customers except upon specific authorization by the FPC.

Certificates subsequently granted to Hope Natural (Docket G-507), to Tennessee Gas and Transmission (Docket G-621) and to United Gas Pipe Line (Docket G-622) all emerged with end use limitations attached. The pattern that is fast becoming standard procedure is to grant an application for new facilities, where such an authorization is patently unavoidable, and then to load the authorization down with limitations that are designed to preclude any new industrial use being made of the gas.

But the above mentioned Northern Natural decision handed down in November of this year while the natural gas investigation was in full swing, represents at once the most arrogant usurpation of authority—and the final challenge to the industry to fight for its right to serve. For in this decision, and for the first time, the Commission injected its weight into the competitive fight between coal and natural gas and stopped the extension of gas into an area on the grounds that coal had been used satisfactorily during the existence of the plant, and the use of gas would displace the coal thus used.

Thus has been accomplished the complete transition from a position announced in early 1944 when the Commission admitted itself to be without jurisdiction, to that obtaining today when it not only asserts the jurisdiction formerly denied, but uses that newly usurped power to prohibit the displacement of coal by natural gas.

It is all very well for editors to carp at the actions of the Federal Power Commission; but we believe that the time has come when the industry must take a stand in its own behalf and against the continued assumption of unauthorized powers by the Commission. We believe that Congress intended the natural gas act to mean just what it says in Section 1 (b) namely:

> "(b) The provisions of this act shall apply to the transportation of natural gas in interstate commerce, to the sale in interstate commerce of natural gas for resale for ultimate public consumption . . . but shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution . . . "

Of all of the companies that have been tossed hampering and restricting certificates by the Federal Power Commission in the past few months it seems incredible that some one or another, or some group of companies, would not have more to gain than to lose by accepting the challenge thus thrown down by an arrogant bureaucracy.

If the language of the natural gas act means what it says, what is there to prohibit natural gas companies from running service laterals to industrial plants that want gas, and supplying them with that service as a matter of legal right under the provisions of that act?

Should a single issue of law thus be presented, it might well result in a court decision that would clear up once and for good the question of what Congress meant when it wrote the now controversial section into the act. Certainly the Commission could have no objection to operating under a clearer mandate than now appears to exist, since it has been subject to two exactly opposite interpretations in less than two years. And the natural gas industry, itself seeking only to comply with the law, would have the attainment of that worthy objective facilitated by a clear unequivocal and final definition of that statute.

Minor Malady

THE furor kicked up by the state of Louisiana in its testimony before the Federal Power Commission in New Orleans would almost lead the casual observer to conclude that the proud and lovely state is unique in its laudible ambition to have great quantities of natural gas consumed by industries within its borders.

As a matter of fact Louisiana's desires are no different from those of Kansas, Oklahoma, Texas or any other gas producing state. They all of them would like to see great chemical industries and industrial plants locate right at the well heads.

But Louisiana is alone in the one respect that she feels that the possession of natural gas under the ground constitutes a weapon of future industrial blackmail whereby fuel and power consumers may eventually be bludgeoned into coming into the state.

With the Monroe field in production since 1916, and with Louisiana still one of the least industrialized states of the nation, it would appear that the test period in which the drawing power of the raw fuel alone would be appraised, must be almost at an end. Louisiana citizens who own gas and oil production, as distinguished from Louisiana politicians who aspire to manipulate it as an implement of self-advancement, realize that any interference with their markets can only result in curtailed production, lower prices, and certain deferment of the income that should be allowed to continue its normal flow back into the state.

The whole Louisiana contention is untenable. The Federal Power Commission must recognize the paradoxical position of an argument that would deny the use of Louisiana gas for boiler fuel in Mississippi, but would burn that same gas under boilers in Louisiana, to generate electric power for transmission into the neighbor state. And Louisiana politicos themselves must recognize in their calmer and non-forensic moments, that to surrender control over end uses of gas to the Federal authority will not help them solve their problems. Should the Commission be given the power to do so, and should it then elect to prohibit the use of gas for certain industrial purposes these prohibitions must perforce obtain in every state Louisiana included. The Supreme Court has consistently held that no state may by any device prohibit the export of its products into other states: and any discriminatory rulings based solely on geographical considerations would inevitably be invalidated in their first court test.

We believe that when calmer judgments prevail it will be discovered that Louisiana, in common with all of the rest of the gas producing states, is suffering from nothing that cannot be cured by the application of a little better price paid for gas at the well head.

Highlights

• Commonwealth Gas Corp. December 5 voted to sell its 49.62% interest in Memphis Natural Gas Co. to a group comprising Kentucky Natural Gas Co., Pittsburgh Coal & Coke Co., Pennsylvania Industries, and W. J. Laney & Co.

• The Federal Power Commission again has assumed authority over "end use" of gas by denying Northern Natural Gas Co. the right to supply an electric utility which sought to use the gas as boiler fuel because such use "would displace approximately 30,000 tons of coal annually". (See Page 21).

• Panhandle Eastern Pipe Line Co. has filed with FPC schedules reducing wholesale rates by $5.1 million in comparison with 1941 gross receipts. Over $24 million will be refunded to consumers.

• Natural gas from fields on the Volga soon will be bringing comfort to domestic consumers and nourish industry in Moscow. The gas will be delivered through a $20 million, 450-mile line with a 60 MMcf daily capacity.

• A Universal gas range (Cribben & Sexton Co.) was the principal freight cargo on the first American Airlines flight from Chicago to London in November. The range was consigned to the British Ministry of Supply.

• Kalamazoo Stove Co. has set up an experimental store where methods of display, merchandising plans, and other phases of retail distribution will be tried out before being installed in retail stores.

• According to a report by Paul Grady of the public accounting firm of Price Waterhouse & Co., 108 electric utility properties have passed from private to public ownership as a result of the Holding Company Act. Tax loss to the government was measured at $350 million. In addition, according to another report by Ebasco Services Inc., public power plants would have paid $125 million in taxes in 1943 had they been taxed on the same basis as privately owned utilities.

• A representative for a group of Texas operators appeared before the Senate Oil Committee November 17 with a plan to buy the "Big" and "Little" Inch pipelines for $40 million or less. Conversion of the lines from oil to gas would cost $25 million. The group has 45,000 acres of reserves.

• New Orleans next year will have what is claimed to be the world's first International Merchandise Mart, where American manufacturers may exhibit products for sales directed primarily to Latin American countries. Many manufacturers of gas equipment and appliances are reported to have spoken for office and display space.

• Rheem Manufacturing Co. has put into production what is claimed to be a new and revolutionary design of portable electric water heater which needs no water supply line but only an electric outlet. Principal use will be for farms which have no lines to points where hot water is needed.

• A small, compact, catalytic cracking unit of entirely new design which is expected to revolutionize the petroleum refining industry was described by Dr. Gustav Egloff, director of research for Universal Oil Products Co., at the recent Mexican-American Conference on Industrial Research held in Chicago. It is said that the unit can be installed at low cost putting the latest refining techniques within reach of small refiners.

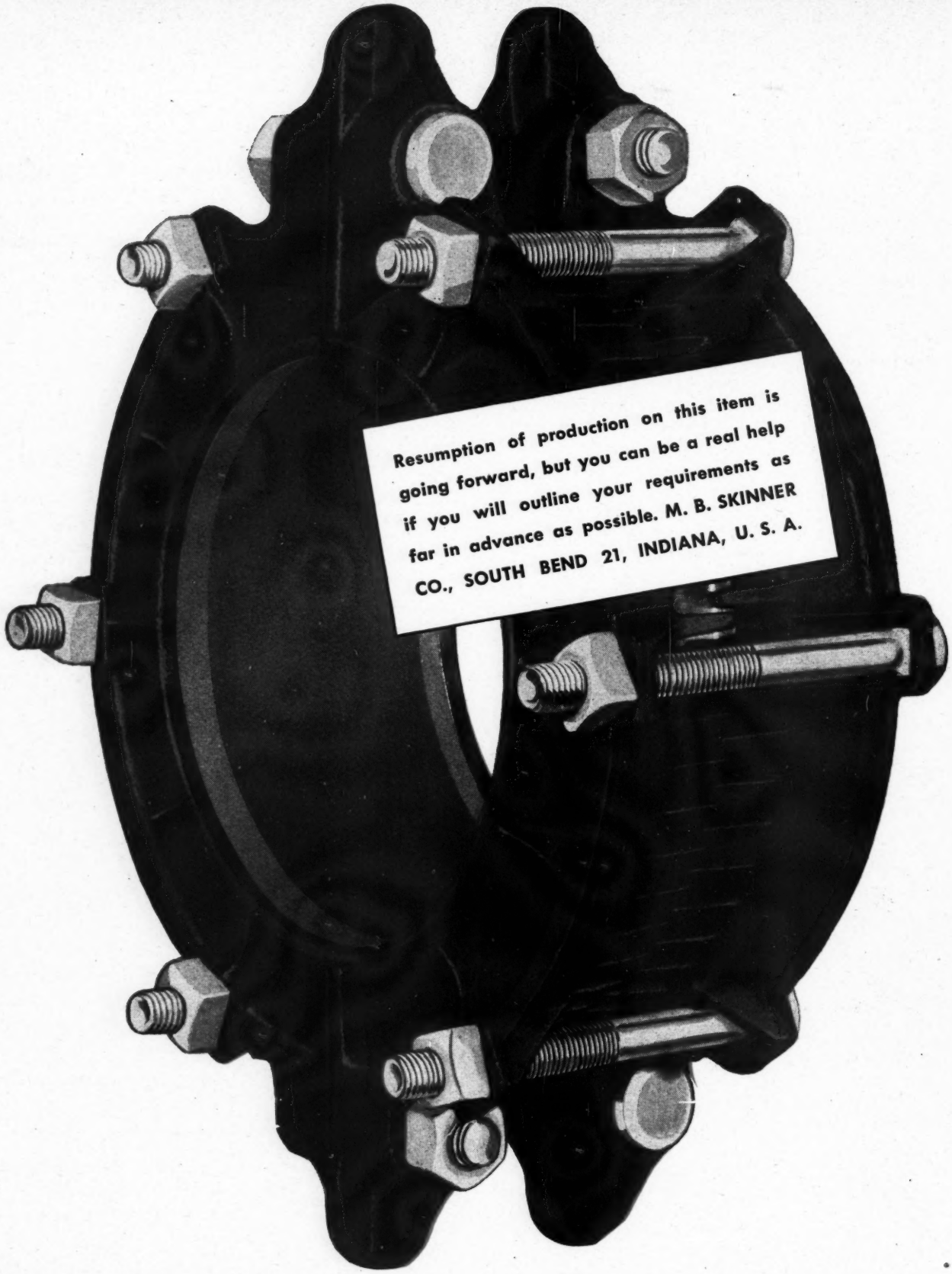
• Total gas consumers in the State of California have been increasing at about the rate of 1000 per month, according to quarterly reports issued by Roy M. Bauer, gas supply supervisor of Southern California Gas Co.

• The board of directors of the American Petroleum Institute last month approved postwar reconversion plans which will include increased public relations activities through the formulation, adoption, and carrying out of a specific and comprehensive program.

• The combined chiefs of staff of the Army and Navy have recommended that the "Big" and "Little" Inch oil lines be sold to private industry with a recapture clause enabling the government to reacquire them in the event of a future emergency.

• Clayton & Lambert Mfg. Co. of Detroit, with the purchase of Hoffman Gas & Electric Heater Co., Louisville, last month announced its intention of becoming Servel's first competitor by producing a gas-operated air-cooled refrigerator to reach the market in about six months.

• Automatic oil heating which now serves more than 2.4 million installations, will extend its market to the 4.5 million mark by the end of the next five years, according to W. A. Matheson, president of the Oil Heat Institute of America, Inc.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FPC NATURAL GAS INVESTIGATION

(New Orleans Hearing)

By ELLIOTT TAYLOR

Washington Editor

THAT the state of Louisiana regards itself as a problem child in the national fuel economy picture, that it expects and will demand preferential treatment on the principle of regional economy and the right to retain its natural gas, and that it is ready to abdicate its states' rights position in the interest of federal control in order to gain the ends sought were the principal matters developed by the state in the New Orleans hearing under the Federal Power Commission's Docket G-580 investigation of natural gas and other fuels. The Louisiana meetings, third in a series of field hearings were held in New Orleans, November 12 to 21 with all five of the federal commissioners in attendance at a number of the sessions.

The opening days of the hearings, which were presided over by supervising commissioner Nelson Lee Smith, were taken up in a large measure by spokesman of Louisiana's current political administration who undertook the responsibility of outlining the position of the state through the medium of prepared statements by present governor, Jimmie Davis, ex-governor, Sam W. Jones and a number of other state officials, elected and appointed.

Gas Supply Jeopardized

The picture generally projected with a considerable number of variations was that Louisiana is in a fair way to become pauperized through the depletion of its natural gas supply and the consequent loss of the economic bidding position that the presence of that gas would make possible. Geological studies were introduced, showing the known reserves of the state to be in the neighborhood of 17 trillion cu. ft., a figure that was generally accepted without question and which is approximately the same as that already arrived at by Dr. E. DeGolyer in his appraisal made for the Natural Gas Industry committee.

Cross examination of all witnesses heard during the sessions was confined largely to questions put by Allen Shotwell, attorney for the natural gas interests, Tom McGrath representing the natural gas obstructionists and Leland Richardson on the legal staff of the state of Louisiana. Despite a vigorously repeated admonition by Commissioner Smith that the hearings were not to be regarded as adversary proceedings, cross examination was maintained in an atmosphere that left no doubt as to the adversary conception being a real one as far as the respective counsels were concerned.

Supporting his state's position Governor Jimmie H. Davis, made an inconclusive and generally unconvincing showing. Under cross examination he displayed an embarrassing lack of knowledge or even of enlightened opinion on the broad implications of the policy that he presumed to enunciate. His testimony added up to the fact that he wants Louisiana gas held available for use in Louisiana, but he wants high field prices to prevail in the meantime. He does not believe that gas end use restrictions that he would have imposed on the gas consuming states should apply to Louisiana.

THE POSITION of the state of Louisiana in regard to Federal control over natural gas has not been entirely clarified, despite the voluminous testimony present at New Orleans in the Federal Power Commission's Docket C-580 investigations. Inconsistencies and even conflicting expressions were all recorded as presuming to be the official attitude of the state.

1. Louisiana constitutes a special problem in the national economy due to the decrease in timbering and agricultural employment.

2. The employment closed by mechanization in agricultural and by the depletion of timber must be taken up by industrialization.

3. Any industrialization to be accomplished will be contingent in a large measure on the availability of a natural gas supply.

4. The natural gas reserves are being drawn upon at a rate that protends early exhaustion.

5. The state is powerless to stop this withdrawal and exportation of gas into other areas.

6. Federal control of end uses should be resorted to on the assumption that these controls would coincide with the policies of the State of Louisiana.

7. The state would not seek to disturb existing contracts but would resist expansion of facilities for the exportation of natural gas.

8. The state would not object to the exportation of gas into nearby southern states, providing no other fuel supply is readily available.

9. The state will countenance no restrictions on the end uses of gas produced and consumed within Louisiana.

Test Case Urged

Ex-governor Sam H. Jones, regarded as the one individual most responsible for the position and attitude of his state in natural gas matters, presented a much more intelligent statement of his views. He believes that the Federal Power Commission already has the authority to regulate end uses, and he urged that it precipitate a test case so that the United States Supreme Court may "determine once and for all whether this problem can be solved under present statutes." The witness with apparent disregard for consistency opined that the use of natural gas under boilers would not constitute waste, providing the boilers are located in Louisiana. He said the state welcomes the use of gas for any industrial purpose within the state.

Louisiana opposition to the announcd policy of the administration was outlined by representative Charles E. McKenzie of the fifth district which embraces a great number of the gas producing parishes of the state. He offered resolutions adopted by the governing bodies of 12 of these parishes, all of which stated a flat opposition to the position being taken by the state officials. At the same time similar resolutions but from ten parishes outside of representative McKenzie's district, were introduced into the record.

The Louisiana congressman declared that "every land owner of my district . . . as an actual or potential royalty owner is vitally interested in his state . . . take no action that would restrict or withhold from the legitimate market . . . the minerals in which he has a royalty interest." Viewing the FPC interests in the matter as being predictated on the desire to restrict and dominate the gas business, he declared that such domination is "another step in the direction of a bureaucratic central government and in opposition to the right of free enterprise". Counsel

for the state and for the gas obstructionists attempted to have the resolutions of the parishes withheld from the record.

Col. P. A. Frye, executive director of natural gas conservation for the state was an exponent in the same vein as ex-governor Jones of the theory that the FPC already has the authority to consider in certificate cases the matter of the end use to which the gas to be transported will be put. In the event that the Commission is unable to "convince itself" that it has such authority, Col. Frye recommends that it go at once to Congress for a clarifying amendment "that would not only give to the Commission such authority, but one that will make it mandatory that such matters be considered in certificate cases".

The witness floundered somewhat under cross examination when he attempted to reconcile his demand for 10c gas at the well head and the need for cheap gas for industrial fuel purposes within the state. A trenchant question by Commissioner Smith revealed another gap in the Colonel's economic train of thought. Having already testified to the effect that gas should not be exported to areas where other fuel supplies were ample and adequate, he was then asked by the commissioner, "When you talk about the export of Louisiana's gas to areas where fuel supplies . . . are ample and adequate, are you using the terms 'ample' and 'adequate' in an absolute sense, referring to the quantity regardless of price, or are you using these terms in an economic sense taking price into account?" The answer elicited was: "I did not take the economics into account to any considerable degree".

Opposition of the Louisiana-Arkansas Mid-Continent Oil and Gas Association to any increased federal control over either natural gas or oil was expressed by Charlton H. Lyons, a Louisiana producer who introduced a resolution to this effect which had been passed by that organization.

Memphis Against Embargoes

The City of Memphis, Tennessee, which is supplied with gas by the Monroe field, in Louisiana, was represented by Thos. H. Allen, president of the Memphis Light Gas and Water Division, a municipally owned utility. Memphis, which has already suffered inconvenience and expense at the hands of the Federal Power Commission and the State of Louisiana in their joint and unsuccessful attempts to refuse the city access to any additional gas supply, is vigorously opposed to the policy of state line embargoes on any product. The Memphis position is that such regulations as are required to effect adequate conservation of natural gas and petroleum should be left to the state conservation departments, "but that federal agencies should provide sufficient control over activities as between states to prevent any interference with the free movement of gas as a commodity in the channels of commerce and trade, and to insure that anti-waste methods in any state do not overstep the meaning of conservation and become in application a barrier to trade or work in the interest of any particular state or group".

Legal Obligation

It was also the opinion of the witness that there exists moral as well as legal obligation to continue the service of natural gas to a community once that service has been inaugurated. He observed in this respect that "in 1928 the City of Memphis was invited and urged to buy natural gas from the Monroe field, in Louisiana. . . . The Monroe field was discovered in 1916 and in a decade had not attracted sufficient industrial consumption of natural gas to prevent the owners of the field from seeking interstate markets. . . . The City of Memphis and the people of Memphis presumed, and had a right to do so, that since gas was available for sale, that it would be moved across the state lines without opposition, restrictions or barriers of any kind. . . . "

Mr. Allen discounted heavily the assumption by some Louisiana witnesses that industry will some day come to the state in search of, or primarily because of, cheap natural gas fuel. He pointed out that industries do not seek to locate near the source of fuel supply, unless many other factors are favorable, freight rates on the raw and finished product, the concentration and location of the consuming market being among the most important.

The closing three days of the New Orleans hearings were devoted in a large measure to the presentation of the views of officials of the state of Arkansas. The Arkansas position is much the same as that of the other gas producing areas, with the exception of Louisiana, which is to resist all attempts at Federal encroachment on jurisdictions that rightfully belong to the state. O. C. Bailey, chairman of the Arkansas Oil and Gas Commission, summarized the position of the state in the following words: "State regulation in Arkansas is geared to scientific investigation with the most modern and best proved principles being applied to the facts in each individual case. Our commission and the witnesses appearing before us are thoroughly familiar with our fields, our reservoirs, our practices and our needs. . . . It is our conviction that state regulation under these circumstances is more effective than federal regulation could be, and that it is more acceptable to our people."

Mr. Bailey said the better prices for gas in the field were always being sought by the Commission, and expressed the studied opinion that end use control would only result in depressing these prices through the interference with the normal flow of the fuel market.

W. H. Cobb, chief engineer of the Arkansas Public Service Commission, presented a study of a hypothetical pipe line and market, which was drawn up to indicate that the elimination of the industrial load in a city the size of Little Rock would mean that domestic and commercial rates would have to be increased by 7c per Mcf.

Some miscellaneous testimony, by independent royalty and lease owners, all of which was in opposition to any further federal interference in states' control over oil and gas production or utilization concluded the eight days of hearings.

The next hearing will be held in Texas, and is at present scheduled to open in Houston, on Monday, January 28th, 1946.

FPC Orders Rate Reduction For Mississippi River Fuel

The Federal Power Commission has directed Mississippi River Fuel Corp. to reduce its wholesale rates for natural gas sold in interstate commerce to utility customers for resale for ultimate public consumption by not less than $945,613 a year or about 27%. The order allocates the company's costs between its regulated sales to utilities and non-regulated sales for industrial use only and fixes the fair rate of return for the company's regulated sales at 6%.

New reduced rate schedules to be filed by Mississippi River Fuel shall be effective as to all bills based on meter readings made after Jan. 14, 1946. When the Commission's order of April 27, 1943, reducing the rates of Interstate Natural Gas Co. by $301,329 is validated by the courts, Mississippi shall pass on the proper portion of that reduction by reducing its rates to utility customers. Mississippi's principal market is St. Louis but the company has seven utility customers in Arkansas, Missouri and Illinois which will benefit by the reductions ordered.

CHANGE-OVER METHODS AND PRACTICES

In Adjusting Appliances for the Utilization of Higher BTU Gas

By ROBERT L. RUNDORFF

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THE change-over of equipment to properly utilize other than manufactured gas is necessary primarily to maintain rated Btu input through the exchange or adjustment of the gas orifices and secondarily to provide additional burner port area, carry-over ports or entirely new and different burners in order to utilize a gas that has different burning characteristics than the manufactured gas which had been previously utilized in the appliances.

A further consideration of a change-over should be to provide passable service to the customer at all times during the progress of the work, with as little inconvenience to him as possible.

Methods of Change-Over

There are two general methods of change-over which probably have as many variations as there have been men in charge of those change-overs. These two general methods are:

a—One step: With this method, the change-over and adjustment of appliances is made with the final gas served to the customer and only one voluntary call made on each customer, except for special work. This method should only be used where it is possible to have small districts and a crew of such size that the longest time any one customer is without an adjustment is no more than three or four days.

b—Two step: The two step method requires two calls and utilizes an intermediate service where either a gas of increased Btu is served or pressures in the distribution system are increased during the period. The customer's appliances are changed over and so adjusted during the intermediate service that flames will require but very little further adjustment on the second call after the intermediate service is replaced with the final gas. The Btu of the gas or the pressure during the intermediate service should be engineered so that orifice sizes used will result in normal Btu inputs when the final gas is served.

The two step method we believe has advantages over the one step method in that the customer's service is better during the entire change-over period; however, the period is longer. Cost is higher due to more labor, overhead and transportation for the second call, but there is some saving in the cost of sectionalizing the distribution system and in using a smaller crew.

The method which is adopted for a change-over will depend largely on preference, the size of the town, the size of districts that can be economically set up, and the crew which can be obtained to handle the job.

Orifices. On the earlier change-overs adaptors were used almost exclusively to reduce the size of orifices. Essentially, the adaptor is an eyelet with a drilled orifice which is riveted into the existing orifice cap. When an adaptor or any fixed orifice is used, it is necessary to cut off the adjustment needle on the gas valve.

WITH THE increasing activity in natural gas pipeline construction, the possibility of the conversion of the "Big" and "Little" inch lines to natural gas, and the more widespread use by manufactured gas companies of liquefied petroleum as a substitute fuel and for enrichment and standby purposes, the mechanics of changing over a gas distribution system and the appliances it serves to a gas of different heat content is again a subject of widespread interest. In this article Mr Rundorff gives a general description of the policies and methods which his company has adopted in change-over work, including a brief description of the two general methods used, materials and special equipment needed, methods of changing burner port areas, customer surveys, preliminary testing, crew organization and training, and general publicity. Appended is a bibliography of articles on change-over and related subjects which have appeared in GAS from time to time. Mr. Rundorff's paper was presented before the Mid-West Gas Conference and School, Iowa State College, Ames, Iowa, in October, 1945.

In use, the adaptor gives good service with controlled Btu inputs but has the objection that air shutters are very nearly closed and so, easily clogged. This may result in complaint calls for smoky burners due to air shutters closed with lint and dust. In some cases Btu inputs have been reduced by screwing back the existing orifice cap on the adjustment needle but too often, especially with older equipment, these needles were too blunt and orifice cap drillings too large to give satisfactory air injection when the Btu input was reduced to proper rating. It is also difficult to judge proper inputs with a screw back adjustment so that the adaptor was usually preferred.

Primary Air Controls

In some of the more recent change-overs different types of primary air control devices have been used. These devices are designed to reduce the velocity of the gas stream and so reduce the inspiration of primary air thus requiring a greater air shutter opening. There are, in general, four types of primary air control devices which have many variations depending upon the manufacturer's particular ideas or design. These general types are:

1. *The counter sunk or velocity reducing orifice*: This type of orifice reduces the velocity of the gas stream by allowing it to expand in a channel larger in diameter than the orifice. The gas stream breaks close to the end of the velocity reducing channel and expands into a thicker gas stream of slower velocity. The gas stream is delivered into the air mixer at a greater distance from the air shutter than when straight orifice or adaptors are used. The amount of velocity reduction and therefore the effect on air inspiration, can be controlled by the length of the velocity reducing channel.

2. *The double or pressure reduction orifice*: This type of orifice acts as a

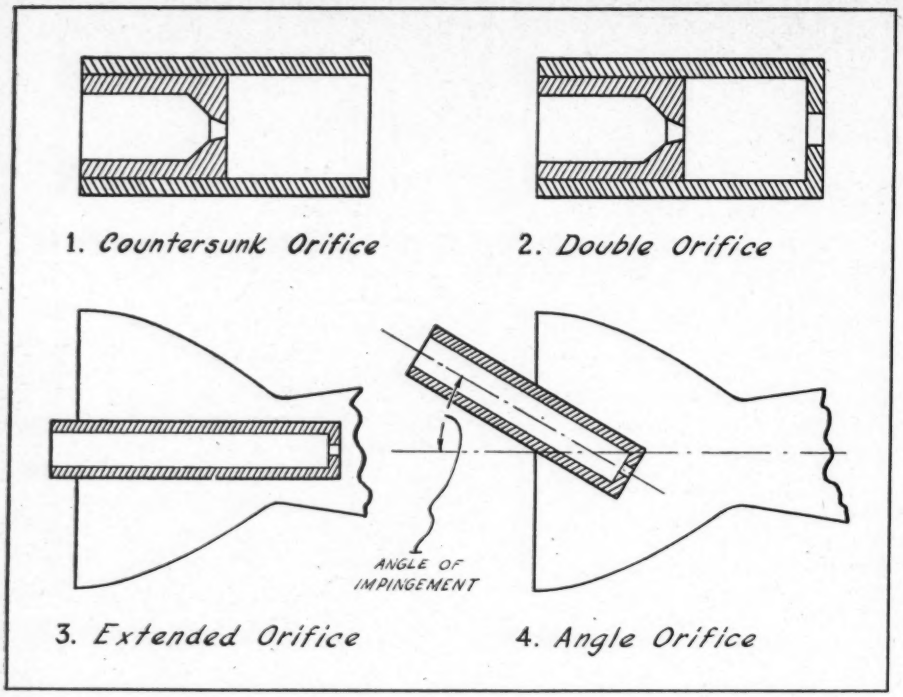


Fig 1. Four types of primary air control devices

calibrating plug, the first orifice reducing the pressure in back of the second orifice. A slower stream of gas with less ability to inspirate air is delivered at a greater distance from the air shutter than with straight orifices or adaptors. The velocity reducing effect can be controlled by the sizing of the two orifices.

3. *The extended orifice*: This orifice delivers the gas stream close to or into the venturi throat. Air inspiration is reduced by moving the gas stream away from the air shutter and by increasing frictional or flow resistance to the air through reduction of the free area of the venturi throat. The velocity reducing effect can be controlled by the depth of insertion into the venturi throat.

4. *The angle orifice*: The action of this orifice depends on decreasing the velocity of the gas stream by impingement on the side of the air mixer, to reduce the inspiration of primary air. The amount of velocity reduction can be controlled by changing the angle of the gas stream from the axis of the burner. It is also affected by the design of the air mixer and is limited to an angle less than one at which gas will back out of the mixer. These four types are shown in Fig. 1.

All of these orifices have a point beyond which no further air injection is obtained no matter how wide the air shutter is opened. This control point varies with the type of orifice, the air mixer, the venturi throat and the burner port area.

The American Gas Association Research Bulletin No. 22, "Primary Air Control Devices for Atmospheric Gas Burners," describes experiments with these types of primary air control devices on a series of eight burners with various types of air shutters. The use of some types of primary air control devices is limited on a change-over because much of the equipment to be serviced was installed from 15 to 30 years ago during which time, very little attention was given to the design of venturi throats.

The choice of orifice to be used on a change-over should allow an air shutter opening at least as great and preferably greater than used with manufactured gas. The choice will also be influenced by the ease and the economics of the installation and freedom from later complaints. This of course will have to take into consideration the many types of equipment that will be found in service.

Burner Port Area

The capacity of a burner operating on manufactured gas is limited by the ability of the venturi throat to inject primary air. This is not true on higher Btu and slower burning gases, where the limits are determined on one side by the lifting of the flames from the burner ports and on the other side by yellow tips.

The average and high operating limits of natural gas are 15,000 to 25,000 Btu per sq. in. of burner port area. It is therefore necessary to increase burner port area of a manufactured gas burner when used with natural gas by increasing the size and in some cases the number of burner ports. Increased burner port area reduces the tendency of flames to lift and also increases air inspiration. In the earlier change-overs, this was done usually by broaching which resulted in a tapered burner port and some irregularity because broaching at best is not an easy job. More recently, electric drilling has been used.

Using an electric drill, it is possible to size burner ports so that there is no torching of the burners at the center. To accomplish this, the inner ring ports are only cleaned out, while the other ports are drilled three to five drill sizes larger. In our experimental work we have found that the shorter a drill is chucked, the easier it is to use.

There are nitrided stove burner drills, made to specifications which are much better than ordinary high speed drills for this work but even so are not good enough for many oven burners. The burner ports in oven burners are often so hard that the metal will dull the hardest drill. Tungsten carbide drills seem to be the best for this use, and while these drills are expensive, we believe that their use for drilling oven burners will more than pay for them in the saving of time and destruction of stove burner or ordinary high speed drills.

Burner Inserts

Burner inserts are usually available for either manufactured or natural gas. The objection to some burner inserts that have been made for natural gas is that in many instances the port area is so great that it is impossible to obtain proper change-over flames during intermediate service, with the result that when the final gas is served, a yellow flame is obtained.

It is not always necessary to purchase new inserts since port areas can be increased through alteration of the manufactured gas inserts. This alteration has consisted of either shortening the port length by milling off a portion of the port space, milling out every other rib, raising the insert with a washer or "Denver Ring," or drilling out every port with the insert in position. We have found that turning off a portion of the port space on the inside of the insert rather than on the outside produces

a more distinct inner cone and cleaner flame.

The disadvantage of removing burner inserts for conversion in the shop, is that the customer may have inserts in good condition replaced by others not as good as the originals. This will nearly always lead to complaint. With the use of a velocity reducing orifice a very satisfactory flame can be obtained on Magic Chef burners by drilling the three ports over the lighter port and the six inside ports with a No. 37 drill. There is a tendency for the flames on the ports immediately over the lighter port to be smothered by the products of combustion from the lighter port which is corrected by the above treatment.

Special Equipment

Industrial and commercial equipment includes special equipment where in many instances it is necessary to replace burners, modify the length of burner tunnels, exchange venturi throats in proportional mixers, replace gas-air torches or alter them by installing a natural gas tip and increasing the length of the mixing tube. Practically all of the equipment used by dentists and laboratories needs to be exchanged. Much of this equipment must be provided with ignition rings to prevent flames from blowing off.

Mechanics of Change-Over

The extent of the planning for a change-over will depend upon the size of the community and whether there is one or several communities to be changed over. The plan of a change-over will usually be as follows:

1. *Survey.* A survey should be made of a sufficient number of domestic customers so that a cross section of the equipment in service can be obtained. In some instances, the equipment of each customer has been listed and the materials required for each customer's equipment has been packaged and supplied to the change-over man with the order for the work. We do not believe this is necessary when the adaptability of the materials available for change-overs is considered. However, the majority of industrial customers should be surveyed so that plans can be made and materials obtained for their change-over previous to the start of the work.

2. *Preliminary testing work.* Testing work should be carried on to prove the plan of change-over and to supply necessary details to edit a change-over manual. The laboratory should be maintained during the change-over to check operation and to work out the change-over of any unusual or "trick" appliances.

The manual should be in sufficient detail so that it can be used in the training of the industrial and domestic crews. It should include tables giving the flow of the final gas through the orifices decided upon, as well as tables showing orifice sizes to be used for various oven sizes, for burners which are not standard based on the number and size of their burner ports, and any other pertinent data which would be usable. In our contemplated change-over, we expect to furnish two manuals, one for domestic and one for commercial and industrial work.

It has been our experience that the delivery of gas through the type of orifice with which we have been experimenting is at considerable variance with existing standard tables and with tables used for other change-overs. Also, that an orifice at room temperature will deliver more gas than one on an enclosed manifold where the temperature of the manifold and therefore of the gas is increased to probably 110-120° F.

3. *Organization of Crew and Training.* There have been a few instances where an outside concern has been commissioned to perform the entire change-over. In these instances, men have been loaned from the local utility to the outside concern to provide the necessary tie-in with local conditions.

The majority of change-overs, however, has been carried on by the utilities themselves. One man should be placed in charge to organize and supervise. The skeleton organization should be built as much as possible from employees of the local utility, while the actual field work is done by experienced change-over men, supplemented by local men who are hired and trained for the job.

Proper identification must be provided for the men. This can be made more positive and the appearance of the crew improved if an overall type of uniform is supplied.

The experienced change-over men will require training in the plan in which the change-over is to be done. The local men will require this training as well as training in gas adjustments, appliances and materials. It is my opinion that crew captains should be men experienced in utility operations as well as in gas utilization.

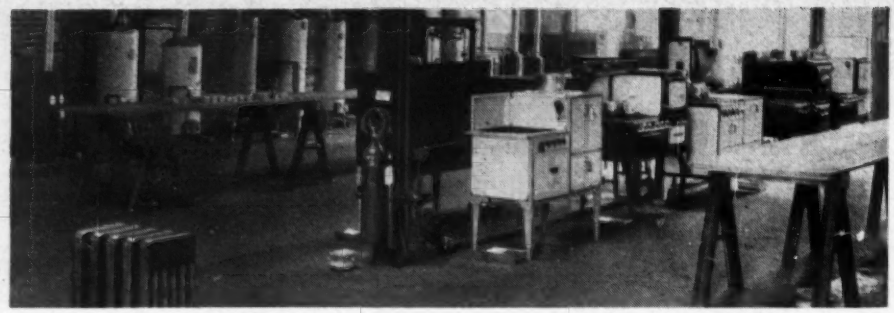
On any large change-over, it would be desirable to have as many men as possible with gas utilization experience loaned for this purpose from other utilities. While this would undoubtedly increase supervision cost, I believe it would improve the actual change-over and result in fewer complaint calls after completion.

Crews should consist of approximately 10 men, one of whom would be a special man. The ordinary change-over men would work on

STANDARD TOOLS AND EQUIPMENT

Used By Appliance Adjusters on Chicago Change-Over

1. Assorted orifices
2. Adapter anvil
3. Reamer handle
4. Cresent wrench
5. Pliers
6. File
7. Hack saw
8. Hammer
9. Soap can and brush
10. Valves—⅛ in.
11. Swab brush
12. Stove cement
13. ½ in. and ¾ in. pipe caps and plugs
14. Large reamer, crimping and extractor tools, thumb reamer, No. 6-32 tap
15. Handbook
16. ¾ in. washers
17. Assorted bolts, ⅛ in. manifold plugs
18. Thermometer
19. Key grease
20. Matches
21. Stove broaches
22. Binder
23. Meter washers
24. Soap and rag
25. Wire brush
26. Wooden plug
27. 2 in. screw driver
28. 6 in. wrench
29. Socket wrench
30. 4 in. screw driver
31. 10 in. wrench
32. Flashlight equipment for special men
33. Assorted orifices
34. Drill gages
35. Handbook
36. Snips
37. Drill index
38. 10 tap wrench
39. 12 tap wrench
40. Assorted taps
41. Hand drill



View of appliances set up in classroom manner for training of change-over appliance adjustors.

ranges and side-arm water heaters; the special men working on automatic water heaters, mangles, incinerators and any difficult jobs which the ordinary change-over man is not qualified to handle.

The industrial crews would consist of experienced change-over men and in districts where commercial and industrial equipment is concentrated, the special men on the domestic crews would be transferred temporarily to the industrial crews.

It has been the experience of most utilities that one week's training for inexperienced men will suffice. The school must operate continuously for some time previous to the start of the change-over in order to provide trained men in sufficient volume to proceed with the work. The quality of the work can be improved and some productive work obtained from the inexperienced man if, immediately after completion of his training, and before the entire crew is assembled, he be sent into the first district along with an experienced man to drill burners. This would give the inexperienced man more actual experience with different types of equipment and with gas adjustments. There would be some inconvenience to the customer in the added call but also some benefit in that the exchange of orifices would not take as long on the change-over.

A complaint crew will be required to clear complaints connected with the change-over work. Complaints will follow the usual run, with increased calls for burner adjustments and change-overs to be made at specified times. The complaint man should complete the change-over or the final adjustment on a call if it has not already been done.

4. *Tools and Materials.* It is necessary to supply a kit of tools to each man, for while the experienced change-over men usually carry their own tools, the local men will not have tools. In order to carry on the work in the manner specified, it will be necessary to supply a kit to each man.

Tools should be charged out and withdrawals to replace worn out or broken tools should be covered by the return of the old tool. Withdrawals for loss should be charged to the man and the amount with which he is charged for such loss on the termination of his employment will be determined by company policy. A clearance tool slip should be furnished to the paymaster before a man's final check is issued.

A shop is necessary to make repairs, and to do work which it is not possible to do on the customer's premises. This may consist of shop conversions, welding, repairs, drilling impossible to do in the field, and any other suitable work. We contemplate the use of a portable shop which would be moved from section to section as the work progressed.

Special purchasing and warehousing will be required for a change-over of any material size. On a large change-over, 25 to 30 days' supply of material should be on hand, with special material, known to be required, to be on hand as early as possible. Working material for the change-over man can be furnished by a supply truck in the district, by the warehouse if kits are turned in each night, or by the foreman who can be supplied with the necessary materials for his crew.

The method used depends largely upon the particular warehouse set-up and on the size of the crew. We believe that an exchange method could be used on a large change-over where the depleted material kits would be replaced when necessary with duplicate sets of filled kits. The depleted kits would then go to the storeroom for replenishment. Since the items used are small and of low individual value, all should be accounted for by weight.

5. *Publicity and Printed Forms.* There are two schools of thought on publicity, one being that general publicity is desirable while the other opinion is that only the sections being worked in should be notified. We believe that the publicity to be used depends to a large extent on the size of the change-over.

If the change-over is small then general publicity should suffice, but if large, only the district being worked in should be notified. We believe this will minimize the number of inquiries from the other districts where people might wonder when the change-over men might be expected.

If the two step method of change-over is used, some information should be given to the customer at the time of the first adjustment advising him that the adjustment is only temporary and that the change-over man will return after service of the final gas.

In addition to publicity on the change-over, printed forms will be required for the execution of the work, tags for shop repairs, warning tags to warn against the use of unsafe equipment in the process of repair, or where change-over will no be completed until the final gas is served. Also, no vent tags to warn against the use of water heaters or other appliances which require proper venting.

One property, as a safety measure, has reduced Btu inputs on side-arm water heaters without vents so that the possibility of carbon monoxide being formed is very remote. They advise the customer that when the heater is properly vented they will, on call, increase the Btu input to the heater. This has proved quite effective.

6. *Transportation.* Transportation should be arranged for supervisors, crew captains and complaint men. It has been the custom for the utility to lease privately owned cars at a flat daily rate, plus insurance coverage, where sufficient company owned transportation is not available. The individual change-over men should not be allowed to use their cars on the job.

7. *Sectionalizing.* Sectionalizing will depend upon the distribution system, the method of change-over and the size of the crew. If the one step method is used, the sections should be of such size that no customer will be without an adjustment for more than four days. If the two step method is used, the size of the sections will depend largely upon the layout of the distribution system and to some

extent on the size of the crew. We believe completion of the first adjustment in a section should not exceed three weeks, and that the final adjustment can then be made in one week to 10 days.

8. *Meter Reading.* On some change-overs, a meter reading is made by the change-over man at the time of the final adjustment. On other change-overs, instead of a meter reading, a prorated bill is made from the regular meter readings and is based on an arbitrary split of consumption of manufactured and final gas taking into consideration the date when the final gas was first served in each district. This second method, we believe, is preferable and can be justified provided a rather liberal policy is adopted for the adjustment of high bill complaints.

9. *Actual Change-Over.* The first step in the actual change-over is the furnishing of an order. The method has been used where every house in the area served by the distribution system is called on and if there are gas burning appliances, the customer's name and address is listed and the change-over is made. If a two step method is used, this same process is followed on the second round, no reference being made to the records of the first call. In most change-overs, however, a conversion order is issued which is made from the accounts receivable addressograph plates. These orders are then arranged for the sections and issued by a dispatcher, with a control card kept to guard against loss of any order. On the second call, we believe a second change-over man should do the final adjusting to minimize "sidewalk" change-overs.

In one of our properties, our tentative plans call for a two step change-over in which the town will be sectionalized. Pressures will be raised to approximately 8 in. in a section and the first call made on all customers in that section. Orifices will be changed to a fixed orifice type of primary air control device, chosen so that on final adjustment air shutters will be approximately one half open. The burner ports on star burners will be drilled to a No. 35-drill size with the exception of the inner ports which will be drilled to a No. 38 in order to prevent torching of the burners.

Side-arm water heater burners will be drilled to a No. 32 drill size with similar provisions for the prevention of torching. Oven burner ports will be drilled to a No. 38 drill size with additional carry-over ports drilled No. 45. During intermediate service and after the adjustment is made, flames will be very sharp; just sharp enough so that they will not flash back in the mixer either when operating or on turn off. When the final gas is served, a clean flame will be experienced in the most cases which will only require a slight adjustment of the air shutter on the second call to produce satisfactory flames.

As our plans proceed, I expect to give further thought to the possibility of splitting the crews into a first and second division. The first division would consist of approximately 200 men and would work only on the first call. After completing the first section they would move on to the second section. The second division would consist of approximately 100 men who would work only on adjustments on the final gas, and would move into a section as soon as the first division's work was completed.

Better adjustments should be obtained in this manner and by balancing the crews, the progress of the work can be kept in step. There would be an additional advantage in schooling since the first division would be given schooling only on actual change-over work for the intermediate service. The second division would be schooled on final adjustments after the first division was at work in the field. I believe this plan would make a better change-over because it would be easier to obtain 100 good men for final adjustments than 300 men.

If the crew is in two divisions complaint men will handle calls in the intermediate service district, and in the district in which the final adjustment is being made. As soon as the final adjustments are completed in a district, that district will be turned back to the regular operating force.

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The Illinois Power Co., Decatur, Ill.;

The Minneapolis Gas Light Co.—Minneapolis, Minn., and

The Northern States Power Co.—St. Paul, Minn.

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(6) Eperiences with Butane Air Standby by M. Frank Knoy, July 1942, p. 20.
(7) Propane Air in Place of Coal Gas, by T. C. Moran, February 1943, p. 28.
(8) Forecasting Gas Sendout, by E. S. Bryant and M. Frank Knoy, July 1944, p. 24.
(9) Liquefied Petroleum Gas, the Sulpha Drug of the Gas Industry, April 1945.
(a) Versatility of LP Gas as a Substitute Fuel, by John Campbell.
(b) Liquefied Petroleum Gas as a Standby Fuel, by K. B. Anderson.
(c) Utility Operation of Isolated Butane Systems, by K. B. Anderson.
(10) Use of Liquefied Petroleum Gases by Natural and Manufactured Gas Utilities, by F. H. Andrews, September 1945, p. 30.

Handbook BUTANE-PROPANE GASES

Part 2—Chapter 1. Properties of the Hydrocarbons in LP-Gas.
Part 6—Chapter 6. Enrichment, Peak Load, and Standby Uses.

Bryant Heater Co. Expands Domestic Line

Bryant Heater Co., Cleveland, plans to have the most complete postwar line of gas heating equipment in the nation, according to Lyle C. Harvey, president. Notable additions to the Bryant line will be gas-fired water heaters, vented wall heaters, portable space heaters, small non-vented wall heaters, and floor furnaces. The addition of units having fabricated steel heating sections will widen the market for the company's amplified line to include purchasers in every price range. The new steel products are also expected to attract warm air heating specialists who have never been able to include Bryant products in their installation specifications.

A complete range of modern hot water heaters will offer a price range based on variations in size, insulation and thickness of tank and will feature flue baffles among other modern design details. Bryant also contemplates a "low boy" hot water heater for kitchen installation, as well as new wall heaters and multiple apartment heating units.

$2,000,000 Project Planned by Hope

Hope Natural Gas Co., Clarksburg, W. Va., plans to spend $2,000,000 in the development of gas wells in West Virginia. Superintendent John A. Clark says the project includes building of 40 miles of pipeline and drilling of 50 gas wells, principally in the company's new Wyoming County field, from which Clark believes the company's gas will be coming in the next 20 years.

SUMMARY OF FINDINGS of the Technical Oil Mission

ALBERT E. MILLER, Sinclair Refining Co., New York, N.Y.; Secretary, Technical Advisory Committee of the Petroleum Industry War Council. Excerpt from paper "The Story of the Technical Oil Mission" presented before the 25th annual meeting of the American Petroleum Institute, Stevens Hotel, Chicago, Nov. 14, 1945.

SOME farsighted individuals in the Petroleum Administration for War gave thought at an early date to the possibility of finding out if there was technical information in conquered enemy countries, particularly Germany, which might be useful to industry in this country in prosecuting the war and to ways and means of obtaining such information. Dr. M. R. Mandelbaum, in the fall of 1943, discussed this subject with C. S. Snodgrass, director of the Foreign Refining Division of the PAW, who called it to the attention of the Military in a letter dated November 5, 1943.

After many initial moves, the PAW, through its membership on the Enemy Oil Committee (EOC) developed plans which were superseded by a directive which provided that the Technical Oil Mission be under the general direction of the Technical Industrial Intelligence Committee (TIIC). This committee had been formed by the joint chiefs of staff so that all Missions from this country to obtain technical information from conquered enemy countries for the benefit of our industries could be given proper government assistance and funnel through one channel. It was composed of government agencies interested in all groups of industry concerned with collecting technical information abroad. The American agency, TIIC, worked through another group known as the Combined Intelligence Objectives Subcommittee (CIOS) which was created by the combined chiefs of staff with headquarters in London.

Summary

The Technical Oil Mission was another example of the excellent team work of the petroleum industry and government that has been characteristic of them in wartime. Of the 26 men that went to Europe on the Mission to obtain technical information and knowledge of processes in enemy conquered countries thought to be of value to the American petroleum industry, 18 were nominated by members of the Technical Advisory Committee of the Petroleum Industry War Council or through their agency, six by the U. S. Bureau of Mines and two were from the Petroleum Administration for War.

The Mission was under the general direction of C. S. Snodgrass, Director of Foreign Refining Division of PAW and chairman of the Fuels and Lubricants Subcommittee of the Technical Industrial Intelligence Committee. The American team, using London as headquarters, worked closely with British teams through the Combined Intelligence Objectives Subcommittee. Donald S. Fraser of PAW acted as coordinator in London and kept the Washington office informed of the progress of the Mission.

Certain members from the TAC assisted PAW in briefing and organizing the Mission. Considerable assistance along this line was also rendered Mr. Snodgrass by the members of his TIIC Subcommittee and by the Bureau of Mines.

Information Obtained by the Technical Oil Mission

The value of the Mission will be disclosed when the microfilm and reports are studied. However, it can be said that from the material so far seen, much information of interest and some of value was obtained on the following subjects:

Acetylene—Excellent information including synthetic method of production.

Alcohols—Production, particularly of the higher alcohols, by synthesis from olefins.

Ammonia—Synthesis of ammonia and of nitrogenous compounds such as nitrates.

Analytical Methods—Many methods of analysis covering all kinds of petroleum products and chemicals made therefrom were located by the Mission.

Aviation Gasoline—A great deal of information was obtained on this subject including synthesis of its components and engine testing.

Butadiene—Very complete information on its manufacture by several processes.

Catalytic Cracking Processes and plants.

Catalysts—Excellent information was obtained on the preparation, testing, life and use of the catalysts employed in synthesizing petroleum products.

Fatty Acids—Complete information of the synthesis of fatty acids from wax.

Fischer-Tropsch Synthesis—Very complete information was obtained from a number of commercial plants for synthesizing petroleum products by this process. The products made and described run from the lightest ends through gasolines, kerosines, diesel oils, lubricating oils and waxes.

Fractionation—Some good information was obtained on fractioning methods and equipment.

Gassification—Very complete information was secured of the German methods for the gasification of solid carbonaceous materials often in connection with the operation of Fischer-Tropsch units.

High Pressure Equipment — Information includes materials, type of construction and controls.

High Pressure Hydrogenation Processes.

Hydroforming

Organic Chemicals—Their production from petroleum by synthetic or other processes.

Patents—Information was obtained as to the status of patented processes and compositions of matter in Germany pertinent to the petroleum and allied arts.

Shale and Brown Coal—Very complete information was secured covering the design, operation and products from such plants in Belgium, France and Germany.

Synthetic Rubber—A good picture was obtained as to the state of the production of this material in Germany. Complete technical data was obtained.

Specifications and Methods of Test—These were obtained for practically all petroleum products used or produced in Germany.

"McCall's" to Feature Food and Appliances

"McCall's" Magazine is planning editorial expansion in food and home appliances because of rapidly expanding post-war developments in home appliances and the techniques involved. **Elizabeth Sweeney,** formerly director of home service for the Central New York Properties of the Associated Gas and Electrical System, will increase the scope of the work in the Household Equipment department of McCall's. **Kenneth Brody** is engineer at the McCall kitchen and test rooms, and **Mrs. Susan Adams** becomes food editor.

THERMOCOUPLES

Their Selection, Application and Limitations

By A. E. KROGH

The Brown Instrument Company

THE thermocouple is one of the most important components of a pyrometer system. No matter how elaborate or costly a pyrometer control system may be, it can do no more than control the temperature of the thermocouple hot junction, and the need for exercising good judgment in selecting thermocouples and their means of protection, cannot be overemphasized. In this article an attempt is made to describe types of thermocouples and protecting tubes available, outlining their respective fields of application and limitations.

In a pyrometer, it is the function of the thermocouple to generate the millivoltage, which is indicated or recorded by the instrument *in terms of temperature*. The thermocouple, therefore, must be of good quality, possess uniform characteristics, and check accurately with the standards to which the instrument is calibrated.

Thermocouple Selection

Three major factors must be considered when selecting a thermocouple, namely:

(1) Required speed of response to change in temperature.

(2) Depth of immersion or distance that the thermocouple must extend into the process equipment, and

(3) Life or time the thermocouple will be expected to retain acceptable acuracy of calibration.

Response: The response of a thermocouple is the speed or rate which it will follow changes in temperature—or simply the time required by the thermocouple to react to a given temperature change.

The rate of response increases as the diameter or mass of the thermocouple decreases. Therefore, small diameter thermocouple wire and tubes should be used on applications where it is essential to detect rapidly small temperature changes, provided such light wire may be expected to give reasonable life. Refer to Tables 1 and 2 describing each type of thermocouple.

Immersion: The depth of immersion of a thermocouple into a process determines the relationship between the true temperature of the process and the temperature reached by the thermocouple.

If the depth of immersion is insufficient, the thermocouple will be lower in temperature than the process due to conduction of heat along the wires as well as the walls of the protecting tube. Therefore, for accuracy of measurement, the thermocouple should extend sufficiently into the process or furnace so that the conduction error is negligible. Although no given rule holds for all sets of conditions, it is generally recommended that the thermocouple be immersed for a minimum distance from inside the furnace wall equivalent to approximately four times the outside diameter of the protecting tube.

Where the thermocouple is installed either through a water cooled furnace wall or through the walls of a muffle furnace, the immersion should be approximately *ten* times the tube diameter. The temperature of the couple head should never exceed 250° F.

Life: The life of a thermocouple may be defined as the duration of time over which the thermocouple retains acceptable accuracy of calibration. In general, the life of a thermocouple increases with the diameter of the wire and decreases with increasing temperatures. Heavy gauge wires more ably resist deterioration and contamination at elevated temperatures, factors which eventually cause a permanent shift in thermocouple calibration.

MANY INDUSTRIAL and technical temperature measurements, and most of those at high temperature levels, depend primarily on the thermocouple as the basic measuring element.

A thermocouple is essentially a junction between two dissimilar metals, which junction produces an electromotive force proportional to the temperature to which it is subjected, and which electromotive force is measured and interpreted in terms of temperature.

The thermocouple is an accurate and dependable device, but only when it is properly selected for the particular service required, and properly installed and protected. The various types of thermocouples available, their uses and limitations, and practical application to various industrial measurement problems, are described in detail in this article by Mr. Krogh, which was first in "Instrument Applications" published by The Brown Instrument Company.

Only by carefully balancing the thermocouple characteristics required for a given application against those inherent in the thermocouple can a wise selection be made.

Types of Thermocouple Elements

From the many possible combinations of dissimilar metals available for making thermocouples, industry has standardized on four types, selected because of their practicability and desirable characteristics. Each of these types is analyzed in the following paragraphs. The limits outlined apply to average industrial installations.

Thermocouples are sometimes used without protecting tubes. The practice should be followed only where temperature conditions are mild and the atmosphere is free from contaminating gases. A discussion of protecting tubes follows that of thermocouples.

Oxidizing and Reducing Atmospheres: The type of atmosphere to which a thermocouple is exposed greatly affects its useful life. An industrial process atmosphere either is oxidizing or reducing. An *oxidizing atmosphere* is one which contains free oxygen. This oxygen tends to combine with some materials, causing scaling, peeling, etc. Other materials withstand this action. In a *reducing atmosphere*, on the other hand there is a deficiency of oxygen, a condition which tends to change the composition of certain materials which are exposed to it. Thermocouples must withstand the action of the process atmosphere or be thoroughly protected from it.

In general, iron-constantan thermocouples perform best in reducing atmospheres. Chromel-alumel thermocouples, conversely, perform best in oxidizing atmospheres. Copper-constantan thermocouples are generally used in low temperature work where atmospheric conditions are not critical and are preferable where moisture is high. Platinum-platinum rhodium thermocouples, when suitably protected, can be used in either oxidizing or reducing atmospheres.

*Note: Radiation pyrometers are finding increased use in many industrial applications involving high temperatures. Specific advantages over thermocouples for these applications include their ability to sight directly through furnaces for the measurement of work temperature and their wider temperature graduations at the high end of the scale.

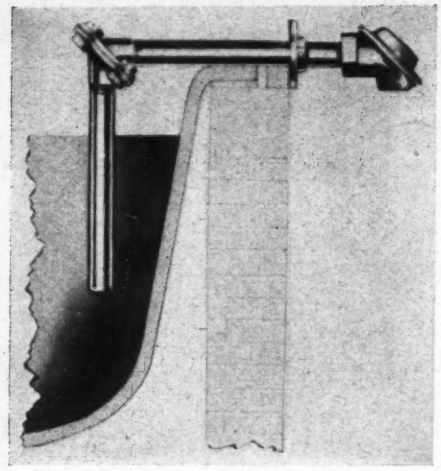


FIG. 1. Thermocouple immersed in molten metal bath of tin, lead or spelter.

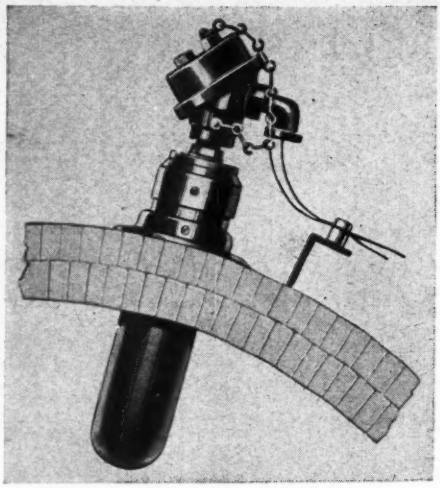


FIG. 2. Thermocouple installed in crown of kiln.

Iron-Constantan Thermocouples (Symbol, I.C.)

These thermocouples are generally accepted for measuring temperatures from 300 to 1400° F. The maximum temperature limits for reasonable thermocouple life depend upon the size of the wire and the atmosphere surrounding them.

Note: Under special conditions, I.C. couples may be used in reducing atmospheres up to 1800° F., but their life is likely to be short and their accuracy questionable at all times.

Oxidizing Condition: For I.C. couples this represents any atmosphere containing more than ½% oxygen.

Reducing Condition: These are, of course, the converse of oxidizing conditions and for I.C. couples should be considered as any atmosphere containing less than ½% oxygen.

Alternating Conditions: Where the atmosphere is alternately oxidizing and reducing, the maximum permissible operating temperature is less than for oxidizing by about 50° F.

Chromel-Alumel Thermocouples (Symbol, M.A.)

These thermocouples are generally accepted for measuring temperatures from 1000 to 2000° F. (Table 2). The temperature limitations of these thermocouples may be stated as follows:

Note: No. 8 gauge M.A. couples may sometimes be used above the limit given, but the life is likely to be short and the accuracy questionable at all times.

Oxidizing Condition: For M.A. couples at elevated temperatures, this represents any atmosphere containing 2% or more oxygen.

Reducing Condition: For M.A. couples, this represents any atmosphere containing less than 2% oxygen.

Alternating Conditions: Where the atmosphere is alternately above and below 2% oxygen content, the maximum permissible operating temperature of chromel-alumel thermocouples is about 50° F. less than that given for reducing conditions.

Copper-Constantan Thermocouples (Symbol, C.C.)

These thermocouples are particularly well suited for measuring temperatures from —300° to +600° F. Their resistance to corrosion due to atmospheric moisture or to moisture condensation, which frequently occurs when measuring sub-zero temperatures, is better than iron-constantan thermocouples.

Generally speaking, they can be furnished with a higher degree of accuracy through the range —300° F. to +300° F. than any other commercially available thermocouple.

Used primarily in laboratory work and pilot plant operation, they are made available only in the smaller sizes, Nos. 20, 25 and 30 B. & S. gauge, with enamel and single cotton insulation.

Platinum-Platinum Rhodium Thermocouples (Symbol, Q.R.)

When suitably protected, these thermocouples are accepted as standard for measuring temperatures in oxidizing atmospheres up to 2900° F. and in reducing atmospheres up to 2700° F.

When hydrogen is present in the atmosphere at high temperatures, it penetrates practically any couple protection and may affect the accuracy of the thermocouples. The rate at which the thermocouple loses accuracy is related to the operating temperature and the amount of hydrogen which enters and remains in the tube. The use of secondary tubes is particularly advisable above 2200° F.

Grades of Thermocouple Wire

To meet the different accuracy requirements of thermocouples, Brown offers two basic grades of thermocouples and thermocouple wire, namely, (1) Regular Grade and (2) Specially Selected. In addition, Regular Grade thermocouples and wire can be furnished with a Brown calibration curve, while both Regular Grade and Specially Selected thermocouples and wire can be furnished with a U. S. Bureau of Standards calibration curve. The regular grade is satisfactory for practically all requirements; specially selected thermocouple and wire are sometimes used where precision beyond that available with regular grade is required.

Summarizing, all Brown thermocouples and bulk thermocouples wire fall into the following classes:

Regular Grade Wire: This is selected wire that closely follows standard temperature-e.m.f. curves. This wire and the thermocouples made therefrom are applicable to all average industrial installations.

Specially Selected Wire: This wire is *specially* selected and follows the standard temperature-e.m.f. curve very

TABLE 1. SAFE OPERATING TEMPERATURES FOR MAXIMUM SERVICE—IRON-CONSTANTAN THERMOCOUPLES

B & S Gauge	Protected Couples		Bare Couples	
	Reducing	Oxydizing	Reducing	Ozydizing
8	1600° F.	1300° F.	1500° F.	1200° F.
14	1200° F.	1000° F.	1200° F.	900° F.
20	900° F.	800° F.	900° F.	800° F.

TABLE 2. SAFE OPERATING TEMPERATURES FOR MAXIMUM SERVICE—CHROMEL-ALUMEL THERMOCOUPLES

B & S Gauge	Protected Couples			Bare Couples	
	Reducing	Oxidizing	Alternating	Reducing	Oxidizing
8	1800° F.	2100° F.	1750° F.	Not Recommended	2000° F.
14	1650° F.	1800° F.	1600° F.	Not Recommended	1700° F.
20	1500° F.	1600° F.	1450° F.	Not Recommended	1550° F.

closely. Thermocouples made from this grade of wire may be used interchangeably without introducing appreciable errors.

Regular Grade Wire With Calibration Curve: Regular grade wire and thermocouples can be furnished with a calibration curve at temperatures of 300, 600, 900 and 1200° F. Thermocouples made from this wire are especially valuable for (1) use as standards to which other thermocouples may be compared and (2) measuring critical temperatures.

Wire With U. S. Bureau of Standards Certificate: Regular grade and specially selected wire and thermocouples can be supplied with a U.S. Bureau of Standards certificate at an additional charge. Usually the wire or thermocouples are certified by the Bureau of Standards to increments of 100 Fahrenheit degrees.

PROTECTING THE THERMOCOUPLE WIRE

Practically all thermocouples used for industrial temperature measurement require protecting tubes or wells. If not protected, the corrosive action of most atmospheres and liquids at high temperatures or mechanical damage may cause early failure of the thermocouple.

The more commonly used protecting tube materials are listed below in the approximate order of their resistance to increasing temperatures. For typical applications, refer to the summary list (Table 3).

Metallic Primary Protecting Tubes

Steel Tubes: These tubes are seamless, made from low carbon steel and are suitable for use in non-corrosive liquids and gases up to 1000° F. This temperature is such that No. 14 gauge iron-constantan couples should meet all demands. They are, however, also obtainable with No. 8 gauge I. C. and with M.A. couples.

Wrought Iron Tubes: Wrought iron tubes are suitible for use in atmospheres containing less than ½% oxygen up to 1300° F. Where greater amounts of oxygen are present, the temperatures should not exceed 1200° F. In non-corrosive atmospheres, wrought iron tubes are sometimes used at higher temperatures where frequent replacement is not objectionable. The temperature limitation of this material is such that iron-constantan couples will meet all demands. They may, however, also be obtained with chromel-alumel couples.

These tubes are sometimes used in low temperature salt and molten metal baths with satisfactory results.

Cast Iron Tubes: These tubes are cast in one piece from an alloy iron produced by the electric furnace process, which improves the grain sturucture and materially increases the general physical properties. They are used principally in molten metal baths and in the chemical industry. They are usually more corrosion resistant than wrought iron and may be used for all applications suggested for wrought iron.

Cast iron tubes may also be used in atmospheres containing less than ½% oxygen up to 1600° F. Where greater amounts of oxygen are present, the temperature should not exceed 1300° F. These tubes require that I.C. couples be used for all applications where temperatures exceed 1300° F. Below this limit, I.C. or M.A. may be used.

Metal Coated Tubes: Metal coated tubes are more suitable for higher temperatures than uncoated tubes. They are also more corrosion and erosion resistant.

They are suitable in atmospheres containing less than ½% oxygen up to 1600° F. Where greater amounts of oxygen are present, the temperatures should not exceed 1300° F. If they are subjected to higher temperatures, shorter life usually results; above 1300° F. sagging may be expected if tubes are unsupported for more than 6 in. from the end.

These tubes require that I.C. couples be used for all applications where temperatures exceed 1300° F. Below this limit, I.C. or M.A. may be used.

Ledite — 14% Chromium Iron: These tubes are drilled from solid bar. Their dense structure makes them suited to certain salt baths and molten metal baths.
Satisfactory results are being obtained in atmospheres containing less than ½% oxygen up to 1400° F. Where the atmosphere contains greater amounts of oxygen, the operating temperatures may reach—but not exceed—1500° F. Chromel-alumel thermocouples should be used with this tube.

Resisteat—28% Chrome Iron: This tube is available as a seamless drawn tube or drilled from solid bar. It is usually more resistant to corrosion and sulfur attack than 14% chromium iron. It is ideally suited to certain salt and molten metal baths. It should be noted that when horizontally installed, the unsupported section of the tube may sag at temperatures above 1500° F. Maximum temperatures of 1800° F. are considered safe for this material. Resisteat is sometimes used for high temperature salt baths, but frequent replacement may be necessary. Chromel-alumel thermocouples should be used with this tube.

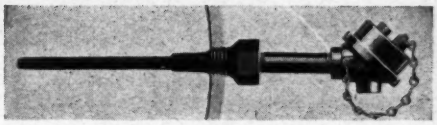


FIG. 3. Thermocouple installed in tank or still under pressure.

FIG. 4. Thermocouple installed in mains or pipes under pressure.

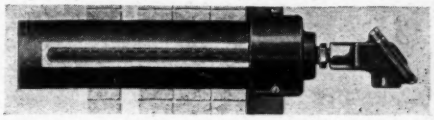


FIG. 5 .Thermocouple installed in pottery kiln.

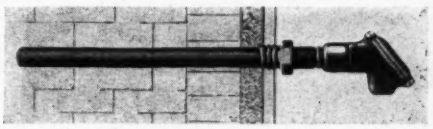


FIG. 7. Thermocouple installed in the heater of water gas set.

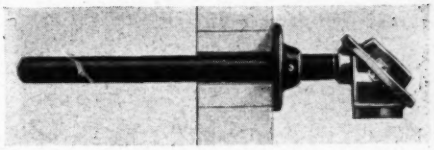


FIG. 7. Thermocouple installed in the crown, side or back of a furnace or flue where there is no pressure.

18% Chromium — 8% Nickel (Stainless Type 304): These tubes are seamless drawn and are sometimes required in process lines in the food, chemical, oil and power industries. They are also required in babbit pots and thinning machines.

Chromel T—20% Chromium—32% Nickel, and Nichrome—14% Chromium—60% Nickel: These tubes have been widely used as general purpose tubes. They are more resistant to ozidation than tubes with lower nickel-chromium content.

Equally satisfactory results are usually obtained in oxidizing or reducing atmospheres up to 2000° F. It should be noted, however, that Chromel T is recommended for higher temperature applications where the atmospheres are highly reducing or sulfurous. The nichrome tube is, in general, more suitable in oxidizing and alternating atmospheres. Chromel-alumel thermocouples should be used with these tubes.

Pure Nickel: Pure nickel tubes are drilled from solid bar and are usual-

TABLE 3. TYPICAL APPLICATIONS FOR PROTECTING TUBES

Steel Tubes

Distillation Retorts
Dryers
Ovens
Lehrs
Preheaters
Economizers
Autoclaves
Stacks and Flues
Molten Metal Baths

Wrought Iron Tubes

Babbitt Pots
Galvanizing Kettles
Economizers
Autoclaves
Furnaces, Low Temp.
Salt Baths, Low Temp.
Dryers
Lehrs
Stacks and Flues
Tin Pots
Zinc Die Casting Machines

Cast Iron Tubes

Salt Baths (below 1500° F.)
White Metal Baths
Zinc Bath or Die Cast Metal
Chemical Lines and Baths
Tempering Baths, Lead

Metal Coated Steel

Annealing Furnaces
Reheating Furnaces, Non-Ferrous
Tempering Furnaces
Steam and Water Lines
Sand Temperatures
Roasting, Low Temp.

Ledite—14% Chromium Iron

Die Casting (where small diameter tubes are required —otherwise use Cast Iron)
Hardening Baths, Lead
Zinc Baths

Resisteat—28% Chrome Iron

Salt Baths (Carbucouple preferred)
Molten Metal Baths

Pure Nickel

Molten Caustic Baths
Salt Baths

Platinum

Molton Glass

Vycor

Annealing & Normalizing Furnaces
Carburizing & Malleabilizing Furnaces
Retorts
Electric Furnaces
Preheaters
Recuperators
Stacks
Dryers
Roasting Furnaces

Sillimanite

Salt Baths, High Temperatures
Regenerative Checkers
Reheating Furnaces
Ceramic Kilns Cont. and Periodic
Roasters, High Temperatures
Furnace Temperatures
Glass Tank Crown
Nitriding Furnaces and Ammonia Dissociators

Firebrick

Kilns, Continuous and Periodic

Coarse-Grained Sillimanite

Ceramic Kilns
Enamel Smelting Furnaces
Steel Mill Furnaces

Durax (Silicon Carbide)

Molten Aluminum, Copper, and Zinc
Steel Mill Furnaces
Reheating Furnaces, High Temperatures

Silica Block

Glass Tank Crowns

ly used only in high temperature molten caustic and salt baths where the presence of nickel does not contaminate the bath. An inner sillimanite tube should always be used to protect platinum couples at temperatures above 1800° F.

Platinum: This tube is used to protect couples measuring the temperature of molten glass. The added protection afforded by the platinum tube strengthens the couple and permits its extension well into the stream of flowing glass. Also, platinum will not discolor or otherwise contaminate the glass batch.

Ceramic Primary Protecting Tubes

Ceramic materials are also finding increased acceptance for thermocouple protection. Their rapid speed of response, ability to withstand high operating temperatures and low initial cost render them highly desirable for many applications formerly employing metal tubes.

Vycor: This is a glass which has the distinguishing properties of exceptional stability, rapid response, high softening point and low thermal expansion. Radiant energy penetrates through by Vycor much as light penetrates a window—hence its rapid response. Another outstanding characteristic is its resistance to thermal shock. Tests show it to successfully withstand instantaneous immersion in gas atmospheres operating at 1800° F.

It makes an excellent general purpose tube No. 8 gauge couples in oxidizing or reducing atmospheres up to 1800° F. When used above 1600° F., the tube should be installed vertically to avoid sagging.

Sillimanite: These well-known tubes are fine grain, unglazed refractory, far superior to other porcelains in performance under severe conditions of operation. They have excellent mechanical strength, resistance to gas penetration and resistance to thermal shock. Tubes with ⅛-in. wall may be safely heated at rates up to approximately 750° F. per minute.

These tubes may be used in oxidizing or reducing atmospheres up to the limits of platinum couples. It should be noted, however, that the unsupported end of horizontally installed tubes will sag at temperatures above 2800° F.

Sillimanite should be used on high temperature applications particularly where rapid changes in temperature occur. Secondary protecting tubes should preferably be used for temperatures above 2200° F.

Secondary Protecting Tubes

Secondary protecting tubes are required to increase the useful life of thermocouples and primary tubes under severe conditions of chemical attack, thermal and mechanical shock and high temperature.

It should be noted, however, that the use of a secondary tube increases the overall time lag of the temperature measurement and frequently introduces complications into automatic control problems.

Metal Tubes: Secondary protecting tubes are available as standard in seamless steel, wrought iron and metal coated steel for galvanizing tanks and other molten non-ferrous metal baths. Their characteristics are covered under Primary Protecting Tubes.

Firebrick: These tubes are made of high grade fire refractory clay having a fusion point of 3050° F. They are used principally as secondary protection for porcelain or sillimanite tubes for miscellaneous temperatures up to 2650° F. in both periodic and continuous kilns.

Coarse-Grained Sillimanite (Mullite): These are unglazed refractory tubes and may be used in oxidizing or reducing atmospheres at temperatures up to 3000° F.

Like fine-grained sillimanite, this material has excellent physical properties at elevated temperatures, and is highly resistant to thermal shock. This material should be used on high temperature applications where uneven heating and/or rapid temperature changes occur.

Durax (Silicon Carbide): This material has high resistance to spalling, possesses high abrasion resistance, exceptional strength at elevated temperatures, and high thermal conductivity.

It is used as a secondary protecting tube on applications up to 3000 F., where uneven heating, rapid temperature changes and mechanical shock are likely to be found.

Silica Block: This material is approximately 95% pure silica. It is available only in the form of a roof arch block for installation in glass tank crowns where the temperatures do not exceed 2900° F.

TRAINING PROGRAM
for Gas Appliance Servicemen

No. 6. Water Heater and Space Heater Servicing

By C. C. WESTMORELAND

THE methods used for instruction of new people on the servicing of water and space heaters corresponds closely with the techniques discussed in connection with range servicing in the November issue. Fundamental principles of gas utilization and specific points of mechanical information are covered through the mediums of lectures, drawings, cut-away appliances and controls. Practice manipulation and the development of a routine are accomplished on operative demonstration equipment and appliances. The only variation will be the new subject matter covered and various points of emphasis depending upon company policy and the nature of the appliance discussed.

Water Heater Servicing

Flame adjustments, automatic pilots, rod and tube thermostats, vents and heat transfer through conduction and convention were included earlier in the course and therefore, their application to water heaters can be covered rather rapidly in the lecture phase of this subject.

The fact that rod and tube thermostats are used almost universally simplifies the instruction relating to heating controls. Individual manipulation on the various rod and tube controls is covered through the use of drawings, cut-away controls and operative demonstration boards similar to the one shown in Fig I. In this manner, students are familiarized with the service problems on water heater controls and are given an opportunity to practice adjustments. Items like dip tubes, flue baffles and water motors are new to the student and warrant more explanation in the lecture phase of the subject. The service policy of the company involved will determine the amount of detail necessary in the training course relating to water heating controls and accessories.

Service to water heaters usually includes items such as lubricating valves, cleaning thermostats, adjusting automatic shut-off devices and calibrating thermostats. Such operations should be practiced by the students as part of their training course. The Job Instruction Training technique has been found particularly adaptable in these cases where manual skills are involved. Although water heaters require less adjusting and servicing than some other type of appliances, routine inspection procedure should be encouraged in students to insure complete coverage of items which might prove unsatisfactory. The housewife's habit of stuffing oily cloths, paper and shopping bags around the combustion chamber or storing cleaning solvent on the top of the water heater is too common to be ignored. Improper installations by home mechanics not familiar with venting requirements is another reason for including a definite inspection routine in the training program.

The American Gas Association Heating Manual and servicing literature published by water heater manufacturers and manufacturers of water heater accessories are good sources for training material. The general instructions at the front of the American Gas Association Water Heating Manual are valuable as assigned reading and as material for the lecture and discussion sections of the course. The detailed instructions on how to adjust thermostats and automatic pilots are helpful in the manipulation phase of training and are useful to new people for reference purposes.

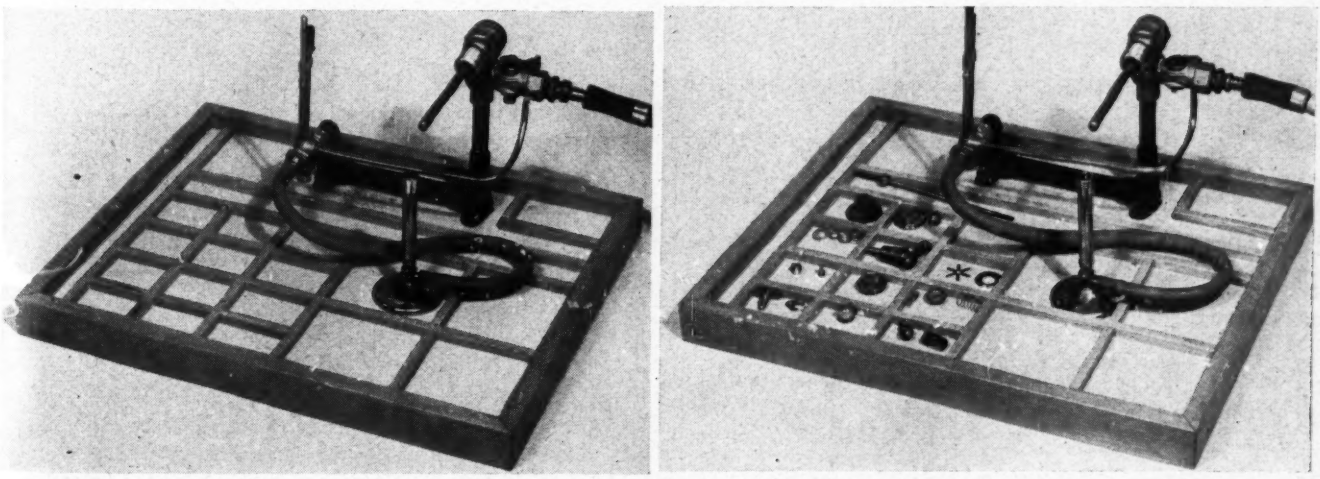


Fig. 1 Manipulation board equipped with Domestic Thermostat water heater controls assembled and disassembled.

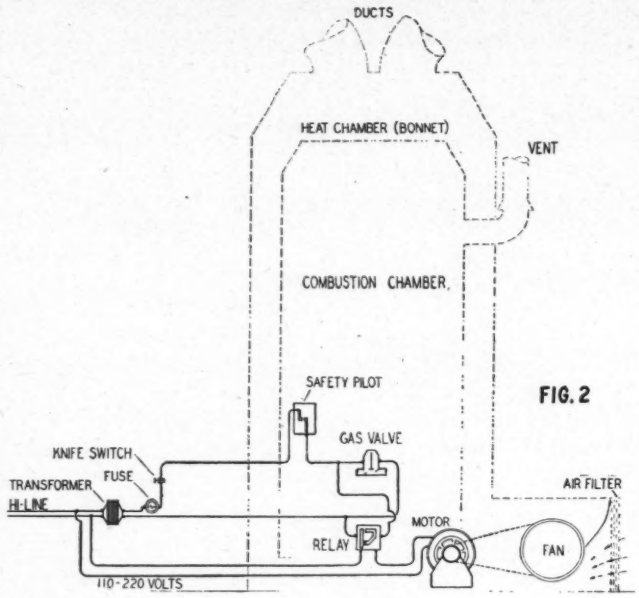


FIG. 2

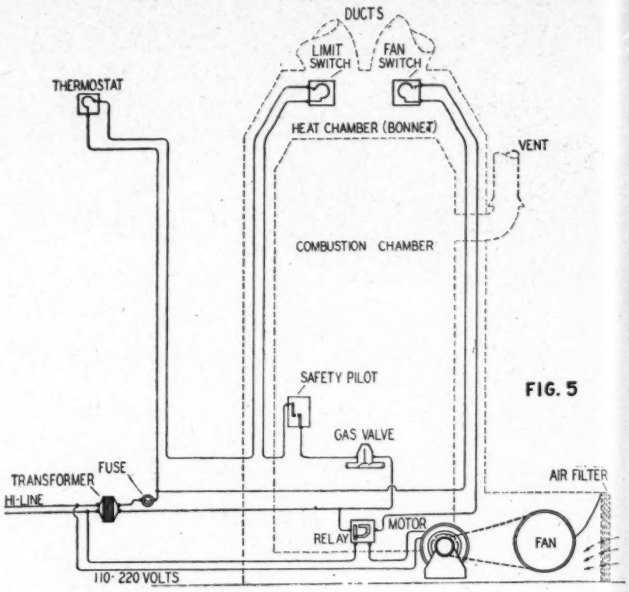


FIG. 5

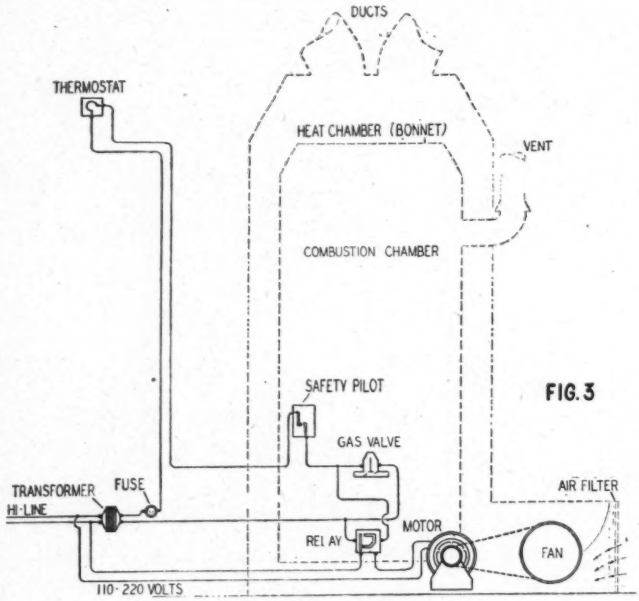


FIG. 3

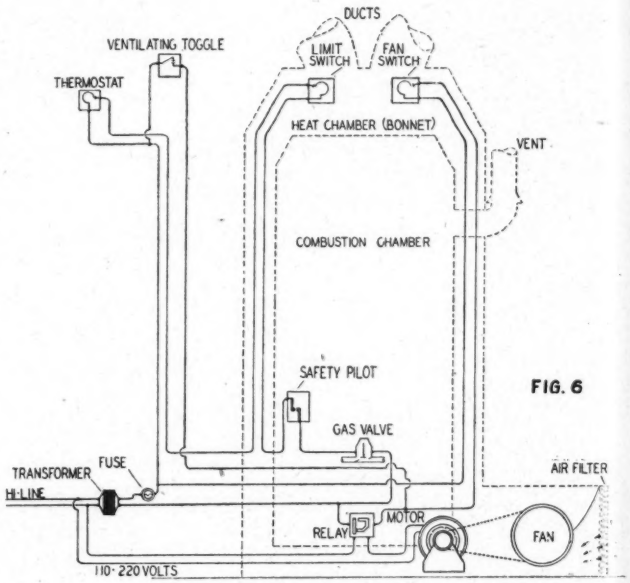


FIG. 6

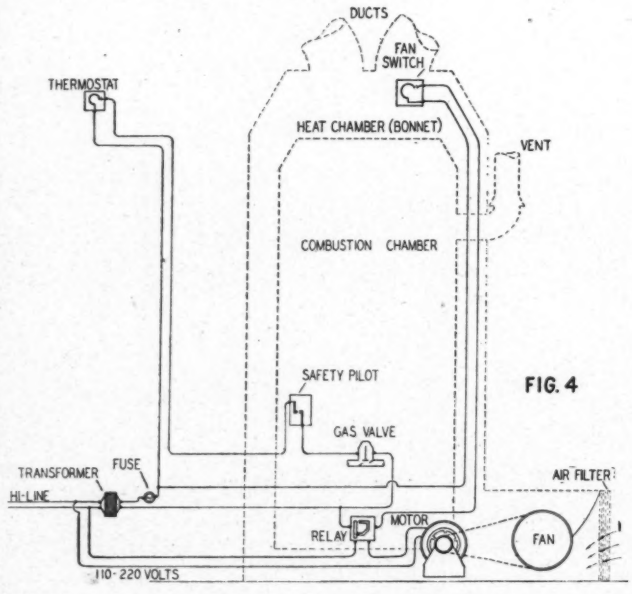


FIG. 4

Figure 2 shows the furnace equipped with a fan and a simple knife switch. This arrangement required attention each time the furnace was started or stopped.

Figure 3 shows a fan and a thermostat replacing the knife switch. This arrangement provided for automatic control but cold air was forced into the room when the furnace was started.

Figure 4 shows the addition of a fan switch which delays the operation of the fan until warm air has reached the bonnet of the furnace.

Figure 5 shows the addition of the limit control which is a thermostat installed to prevent the furnace from overheating in the event the fan belt breaks or the filters become clogged.

Figure 6 shows the forced air furnace control arrangement complete with a ventilating toggle used for circulating air during the summer months.

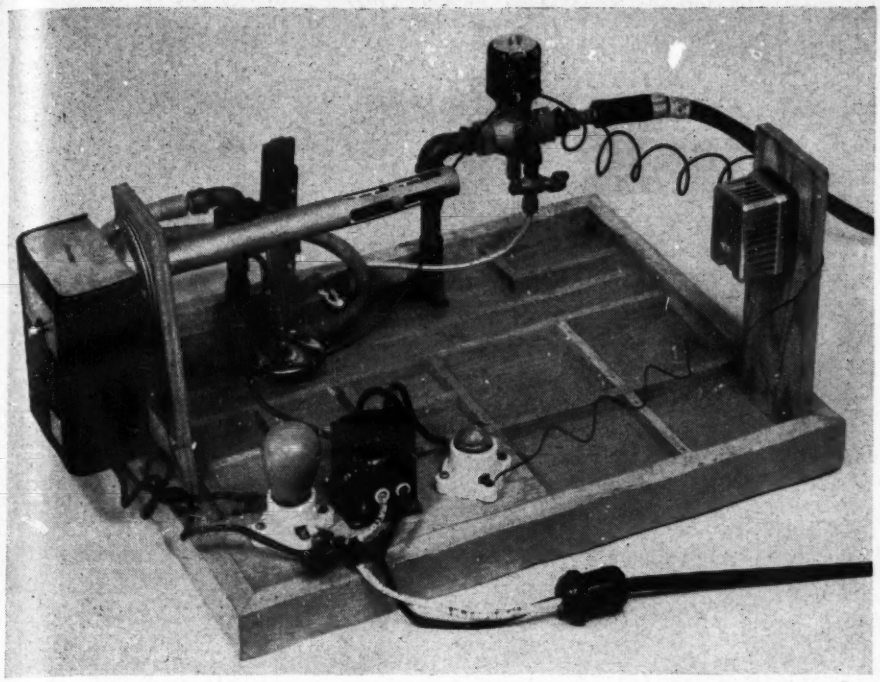


Fig. 7. Manipulation board equipped with forced air furnace controls.

The equipment necessary for conducting this course should include representative types of controls and at least a few representative types of water heaters. Manipulation boards similar to the one illustrated in Fig. 1 can be used to represent the controls found on various types of water heaters, thus reducing the number of complete water heaters it would otherwise be necessary to have in the classroom.

Portable Space Heater and Furnace Servicing

Instruction on these two subjects is complicated by the fact that no manual has been prepared by the gas industry relating to space heating. The mechanics of adjusting portable space heating is usually not involved or complicated. With adequate instruction, new servicemen readily learn how to get satisfactory flame adjustments on good portable space heating equipment.

The major training problem is familiarizing them with old models which cannot be adjusted satisfactorily. Since most of those unsatisfactory models have been in use for many years, they are well known to most utilities who have ceased trying to make them operate satisfactorily. If a few representative models of unsatisfactory heaters are available, they can be used to good advantage to point out fundamental principles of design have been violated. Pictures showing the construction details of other common makes are helpful in teaching new people when not to attempt adjustments.

The operation of gravity furnaces and forced air furnaces are not so apparent, and inexperienced people require some explanation to give "students" an understanding of how they are constructed and operate. The series of drawings shown in Fig. 2, 3, 4, 5 and 6 have been valuable aids in teaching servicemen the function of the various controls used commonly on forced air furnaces.

Operation of Controls

By adding one feature at a time in this manner, what appears to be a rather complicated mechanism, be comes quite simple. The next step is to introduce the control shown diagramatically in the drawings. The manipulation board shown in Fig. 7 is one method which has proven effective. By connecting the board to a supply of gas and electricity, all

Greasing and Cleaning Instructions

1. Remove knob and cover plate.
2. Remove stop. Care should be taken not to lose bushing.
3. Depress contact points and remove valve core assembly. NOTE—On certain models valve core assembly will not clear plunger. On these models, remove top cover plate, metal and rubber disks, and plunger.
4. Wipe all parts clean.
5. Fill grooves in core with vaseline, wiping off all but thin film on core. Remove all surplus grease.
6. Replace core. Check for free movement of core by turning manually.
7. Reassemble. Be sure contact fingers make good contact when core is in proper position.
8. Check for leakage through the valve.
9. Check operation of valve and sequence of lights by pushing button.

NOTE—Normal sequence of lights: High—Red and white; Medium—White; Low—Red.

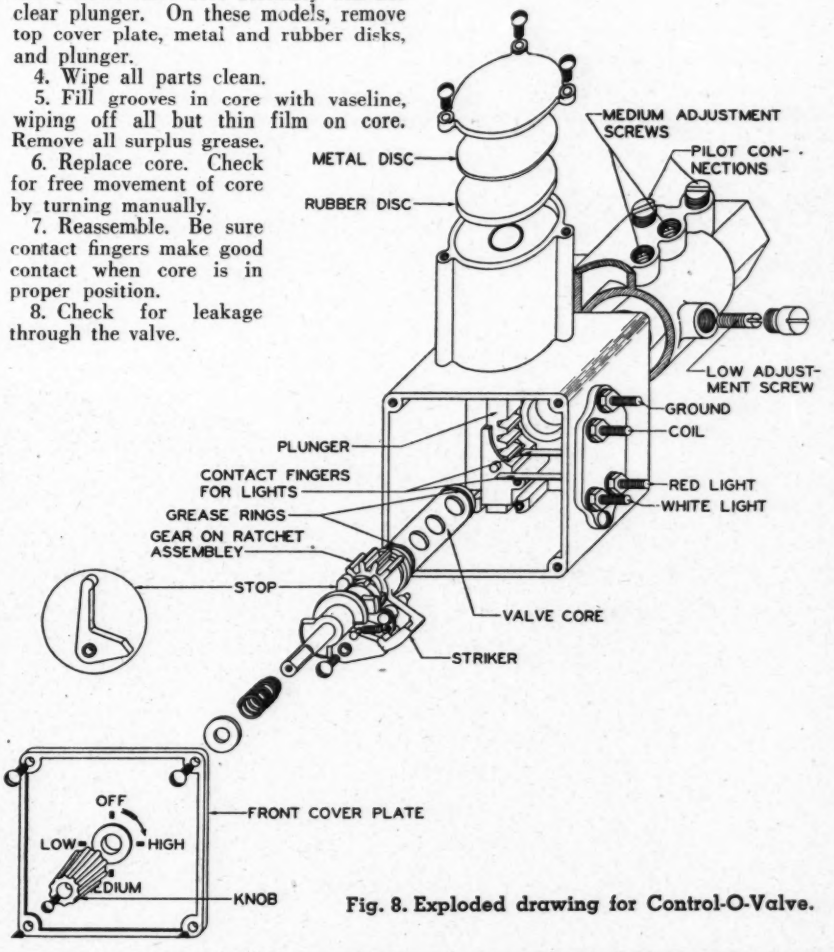


Fig. 8. Exploded drawing for Control-O-Valve.

the controls can be made to operate as though they were installed in a forced air unit. The final step is to familiarize the trainees with the operation of the controls in an actual furnace installation. There are some advantages in covering this point in the "classroom" under the supervision of an instructor, but it may be considered a part of the field training or experience phase of training providing the new man is adequately supervised during his initial field experience.

"Exploded" Drawings

During the war period, industries which had assumed responsibility for producing war equipment, were faced with the problem of instructing new people how to assemble rather complicated mechanisms. The conventional blue print did not meet that need because large numbers of people working in war plants had not received instruction on blue print reading. The problem resulted in the development of three dimensional drawings which were named "exploded drawings," because the various parts were in proper relationship to each other. That technique proved very effective and was widely used with good results. The "exploded drawings" have also been used effectively in training appliance mechanics in the dismantling and servicing of gas appliance controls.

Fig. 8 illustrating the widely used "Control-O-Gas" Valve is a good example of how this type of drawing can be used in the appliance servicing field. Large photostats of these drawings are helpful in classroom discussions for new people, while smaller copies are helpful for reference purposes by servicemen in the field. The cost of such drawings is higher than photographs or simple line drawings but instruction presented in this manner is frequently so clear that it is usually not necessary to hold the customary meetings to discuss the subject. When that economy is considered, the "exploded" type of drawing is an inexpensive method for issuing training material.

Portable Compressor for Line Testing

AS part of Panhandle Eastern Pipe Line Co.'s program for raising the operating pressure on Line No. 200 from 500 to 600 lbs., it was necessary that the line be tested to pressure higher than the operating pressure. Since some of the compressor stations could not be equipped to discharge at this higher pressure in time to complete testing of the line by Nov. 1, it was necessary that a portable compressor unit be used for testing where the main line stations had not been converted to the higher operating pressure.

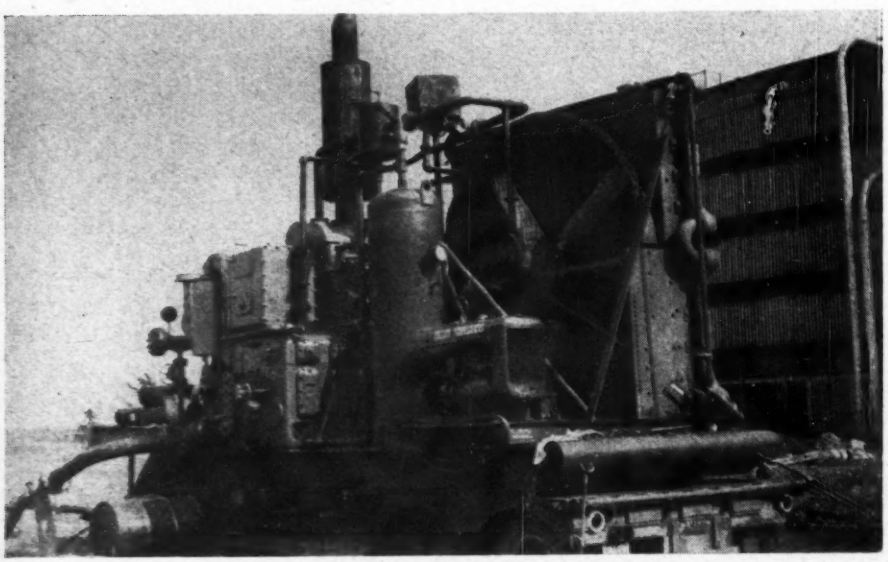
This compressor was a 300 hp. Clark engine with four power cylinders and two 5 in. x 14 in. compressor cylinders. In order to make this unit portable, it was necessary to mount it on skids and provide a radiator for cooling the water and oil.

A small auxiliary compressor was also provided to furnish air for starting. This auxiliary compressor and the air receiver were also mounted on the skids with the main unit. All of this equipment was loaded on a low-boy trailer for moving from place to place along the pipeline.

In operation, the portable compressor unit was set up approximately 300 or 400 ft. away from the main line at a main line gate setting. A 6 in. intake and discharge line was laid from the 6 in. blow-offs on each side of the main line gate and connected to the portable compressor. The section to be tested was isolated from the rest of the system by closing the main line gates. In order to complete test in the shortest possible time, the pressure was raised on the test section to approximately 550 lbs. with the main line stations before starting the test with the portable unit.

The portable compressor unit was used for testing 40.25 miles of the Liberal line, 73.40 miles of the Louisburg line, 28.5 miles of the Houstonia line and 37 miles of the Glenarm line, or a total of 179.15 miles of 22-, 24- and 26-in. pipeline.

This method of testing lines proved to be satisfactory although the time element is much longer than when testing with the main line stations. It was also found that due to the size and weight of the portable unit, it was impossible to move the unit to all locations along the pipeline, but this difficulty was overcome by testing more than one section of the line at a time at the locations where it was not practical to set up the portable unit.



Portable compressor unit used by Panhandle Eastern Pipe Line Co. for testing lines at higher than operating pressures.

Meter Shortage in Brooklyn

The Brooklyn Union Co. has temporarily halted the sale of gas house heating equipment because of a shortage of meters and manpower.

GAS MEN in the SPOTLIGHT

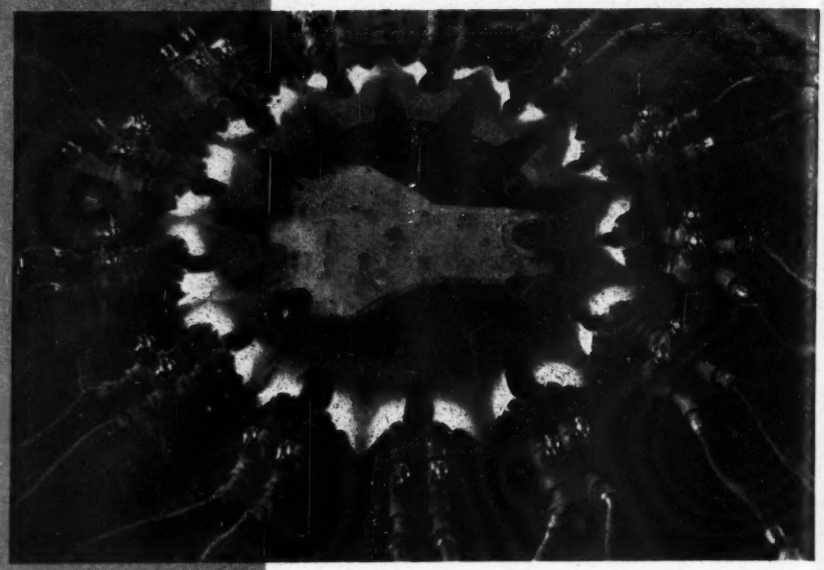
Luncheon Table during Organization Meetings for 1945-46, Technical Section, A.G.A., Atlantic City, New Jersey, November 12-13, 1945, showing guests recently returned from Overseas inspections—left to right: L. L. Newman, U.S. Bureau of Mines, Washington, D.C.; Commander E. S. Pettyjohn, U.S. Navy, Washington, D.C., Director, Institute of Gas Technology; Lester J. Eck, Minneapolis, Minn., Chairman, Technical Section, A.G.A.; Dr. H. H. Lowry, Carnegie Institute of Technology, Pittsburgh, Pa.; Dr. A. R. Powell, Koppers Company, Inc., Pittsburgh, Pa.; A. Gordon King, Secretary, Technical Section, A.G.A., New York.

Some of the officers and members of the Gild of Ancient Supplers, who met briefly at the Engineers Club, New York City, Oct. 24 (left to right, seated): Clerk Van Norden; Alderman Sorby; Retiring Mayor Bartlett; Mayor-Elect Mulcare; M. J. Harper and William H. Parish; (Standing) Sergeant-at-Arms Harry Grassmann; W. J. Foster; H. W. Cheeseman; S. H. Hobson; F. L. Fairchild; E. W. Mears; H. O. Andrew and A. McW. Wolfe. Wardens will be appointed by the Mayor.

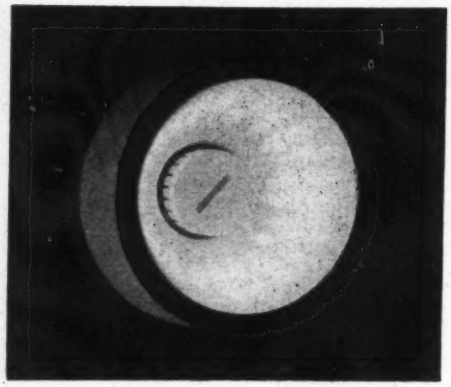
Above, Mr. Hartson (left), Vice President and General Manager of the Equitable Gas Company, is shown presenting the American Gas Association's Million Man Hour Award to George H. Neilson, Jr., general superintendent of production and transportation, while H. H. Pigott, operating manager, looks on.

Members of the A.G.A. Sub-Committee on Approval of Domestic Gas Copy, consultants, representatives of advertising counsel and guests review the gas industry's national advertising program at St. Louis, November 14 and 15. Seated, extreme left: W. H. McInnis; Thos. H. Spain; Miss Noel Mallaby, McCann-Erickson. Seated at table, left to right: Clayton G. Cassidy; Frank C. Packer; Newell E. Loomis; Col. John H. White, Jr., A.G.A.; Miss Gussie O. Jones; W. L. Hutcheson; Miss Margo Sherman, McCann-Erickson; J. J. Quinn; C. W. Person; Alfred Hirsh; W. C. Grant; G. A. Saas; L. C. Ginn; W. M. Jacobs; Arthur P. Kelly; Wm. B. Hewson. Standing, left to right: R. K. Stover, McCann-Erickson; W. E. McKeachie, McCann-Erickson; R. D. Lewis; Kenneth Fellows; R. J. Canniff; Henry Obermeyer; R. J. Vandagriff; Wm. Harrison, McCann-Erickson; Thos. P. McMahon, McCann-Erickson; H. Vinton Potter; Roger A. Gordon is not in the picture.

RAPID FLAME Heating Techniques for Brazing and Hardening Metals



No. 5591—Teeth of M-4 tank sprockets, pattern hardened in a dual automatic machine at rate of two every seven minutes. Predetermined cycle lowers sprocket and ejects it into immersion quench tank. Second view—burners off immediately prior to quenching, hardenable pattern visible.



A radiant burner in operation.

By JAMES B. HENWOOD

Research Engineer,

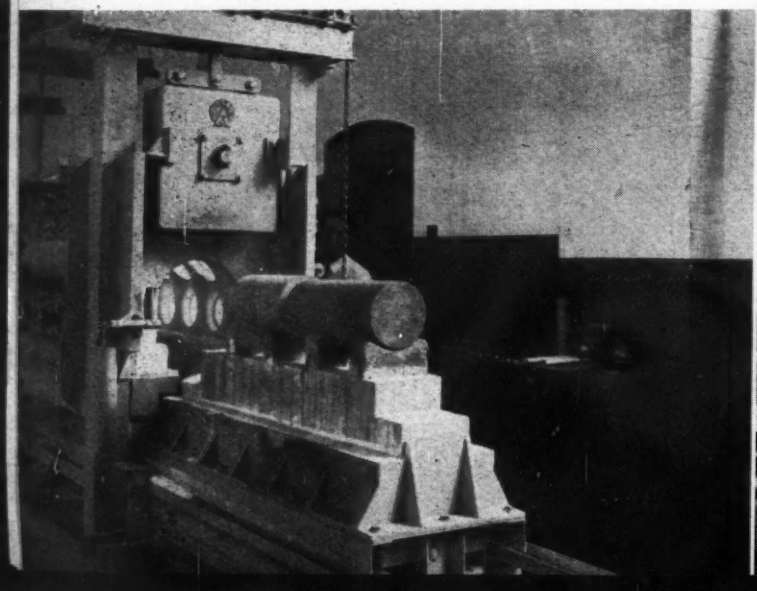
Heat Process Laboratories,

Selas Corporation of America

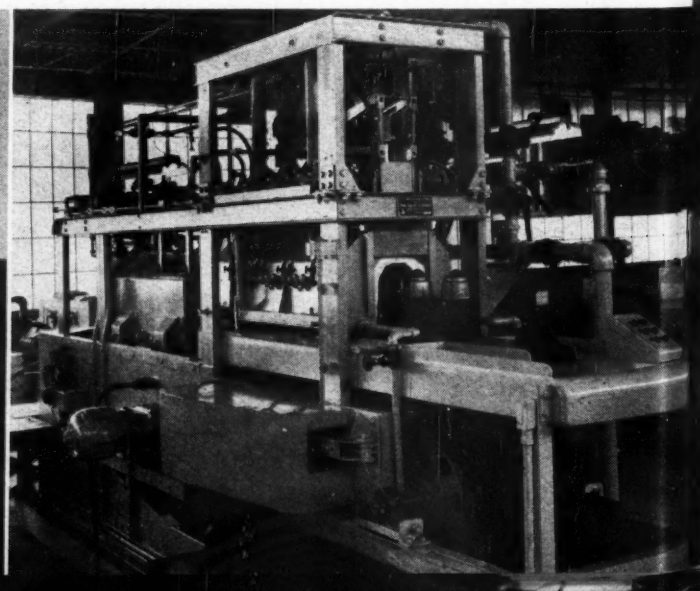
RECENT developments in the field of industrial heating using new techniques for the combustion of commercially available gaseous fuels with air has made possible the economical production of a wide range of parts requiring the application of heat in definite patterns, at definite rates, and to definite temperatures.

The accomplishment of these heating effects is primarily dependent upon a completely integrated combustion system, the design of which is planned to take full advantage of the excellent combustion characteristics of gaseous fuels. The gaseous fuel used may be manufactured gas, natural gas, or liquified hydrocarbons, all of which

High speed heating of copper alloy 9″ x 15″ billets. Time to 1650°F. 15 min. Surface to center temperature differential at this time less than 50°F. Radiant burners at high temperature head six in. from the billet were used for this application.



Six in. shot caps weighing 27 lb. each are pattern hardened at the rate of twenty-four per hour. Radiant burner cups may be seen at the entrance of the tunnel throughout which they are distributed and adjusted to provide desired pattern heating.



are readily available to the industrialist at modest cost. The air mixed with the fuel to form a combustible mixture is of course free so that the unit cost of heat energy is relatively quite a small item in most production applications.

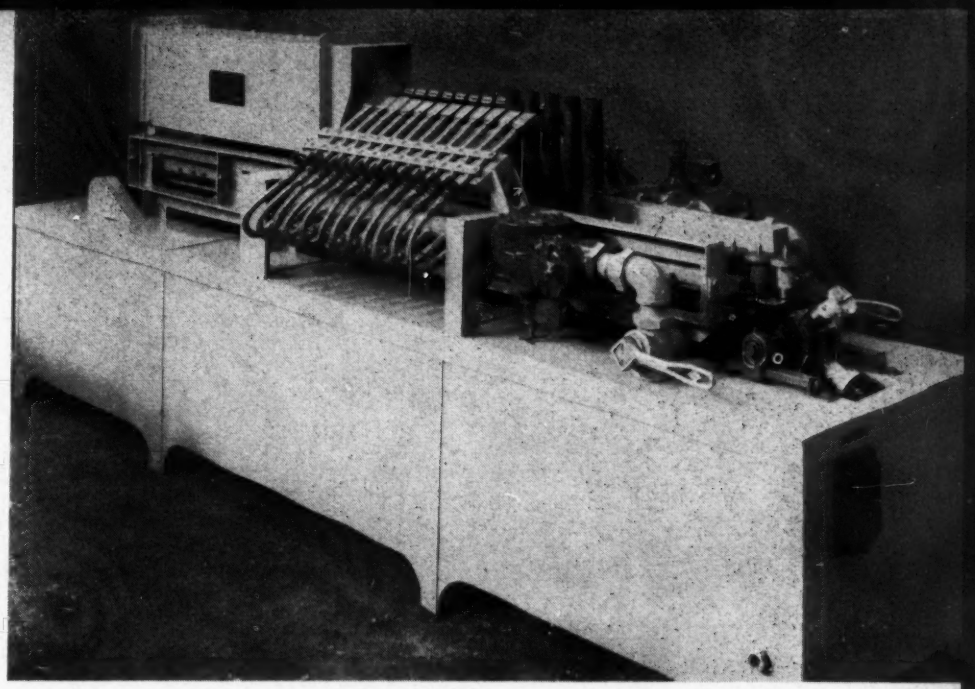
The Combustion System

The combustion system consists of a combustion controller, a fire check, and a burner or system of burners. The combustion controller consists of a precision gas-air mixing or proportioning valve connected to the inlet side of a compressor of either the positive displacement or centrifugal type. An intimate combustible mixture in theoretical proportion is delivered by the compressor at elevated pressure —at the present state of development approximately 3 lbs. per in. gauge. The mixture of gas and air prepared in this manner for complete combustion is delivered to the burner system from the outlet of an automatic fire check, the function of which is to protect the combustion controller against inflammation of the entire system due to accidental pre-ignition of the mixture behind the burner.

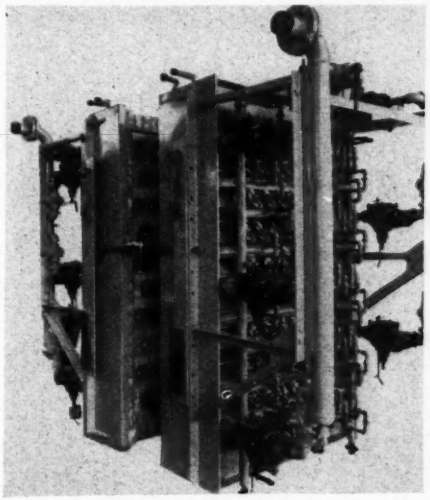
The burners principally involved in these rapid heating techniques consist of two distinct types, both, however, utilizing the beneficial effects on combustion rates of accurately formed ceramic shapes maintained at high temperature in close proximity to the combustible mixture.

Internal Combustion Nozzle

One is in effect a continuous high temperature internal combustion nozzle which delivers a stream of 3100°F. products of combustion at a theoretical velocity of approximately 1000 feet per second from the nozzle. The nozzle is part of the combustion chamber and is constructed in many cross-sectional shapes, i.e., circular, rectangular, "S" shape, "U" shape, annular, etc. The reason for this variety of nozzle shapes is to permit following the contour of the workpiece desired to be flame heat treated with the high temperature high velocity products of combustion with which high rates of heat transfer are obtained. It has been possible thus far to obtain heat releases within the combustion chamber of 30,000,000 to 40,000,000 Btu. per cu. ft. of combustion space per hour while usual gas combustion practice has indicated a design value of 25,000 to 80.000 Btu per cu. ft. combustion space per hour with several extreme instances of 400,000 Btu per hour.



No. 5896—Localized neck heating of 12 in. long steel shell cases with ceramic cell type burners followed by slow cooling in insulated chamber to produce anneal. Hourly production 1500 pieces.



Radiant panels each containing seventy-five radiant burners supply heat uniformly to .008½" electrolytically coated steel 30" wide strip for fusion of the deposited tin at a rate 500 ft./minute. Controllability and rate of heat input to the strip make such an application highly practicable.

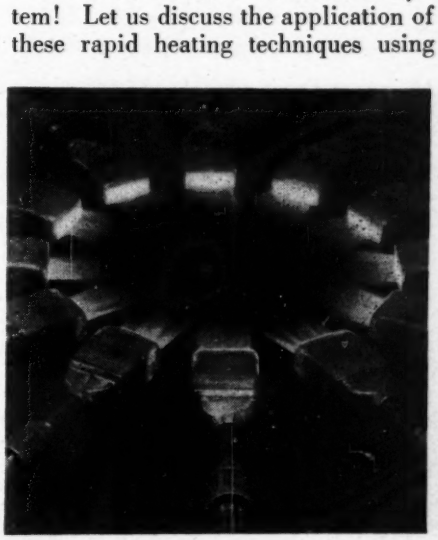
Radiant Burner

The second type burner is generally known as the radiant burner. Combustible mixture is admitted radially along the surface of a ceramic cup from an accurately molded ceramic distributor tip located at the center of the base of the cup. Essentially complete combustion is obtained at the surface of the cup resulting in a high temperature surface capable of emitting heat radiation. Unlike the combustion nozzle or so called "Superheat Burner" just described, localization of heat input is not obtained to the same degree but a uniform incandescent radiating surface is produced which, depending on the requirements of a given application, can be maintained at any temperature from approximately 1300°F. to 3100°F.

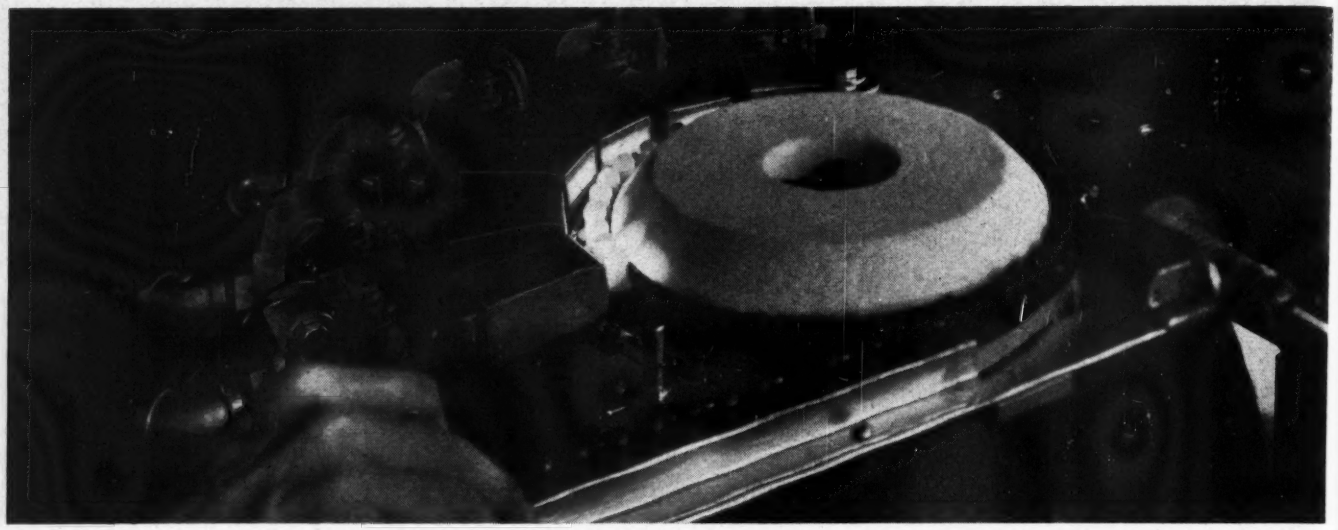
The heating up time of these burners is insignificant, being a matter of several minutes to reach working temperature, and it is an important point that development work has been directed in the case of both burners toward obtaining complete combustion within the burners and not in the space existing between burners and workpiece.

Applications

So much for the combustion system! Let us discuss the application of these rapid heating techniques using



A group of high velocity burners. Tongues of high temperature "products of combustion" can be seen issuing from the burners. the diameter of the circle formed, approximately 12 in. Heat release 130,000 Btu/hr.



Airplane pushrod ball ends travel in circular path between ceramic cell burners and stationery refractory reflectors. Immersion quenched at the rate of 1200 to 1500 per hr.

gas and air in an attempt to visualize a trend in heating methods whereby production is increased, unit costs deceased, products improved in quality and floor space conserved.

The ability to release great quantities of heat at elevated temperatures adjacent to unit areas of work pieces with compact burner equipment has permitted localized heating of these areas. If the heating element is extended to cover the entire workpiece, a billet or a bar, for example, rapid heating rates, at the present time 2 to 4 minutes per inch of thickness for steel to 2000°F. forging temperature, are readily obtained. Thus rapid heating of an entire object is usually accomplished by an envelope of "Radiant Burners" while selective heating of definite small areas to controlled depths is more often accomplished with the "Superheat Burner". This flexibility of application makes it possible to attain many desired results, whether it be hardening, tempering, stress relieving, annealing, or heating for forging or rolling. In many instances straight line continuous production is easily incorporated in the application of the combustion system to automatic machines.

Better Results

Thus far no deleterious effects on metals have been attributed to rapid heating techniques as reported in American Gas Association Research Project No. 48 entitled "Physical and Metallurgical Effects of High Speed Direct Air-Gas Heat on Metals". This project covered a representative group of ferrous and non-ferrous alloys and provides a very good overall metallurgical picture of the results obtained through the use of these techniques. For example, grain growth, scaling and decarburization are a function of time, temperature, and atmosphere. Why should an object be heated, say one hour, in a furnace when an equal or better metallurgical result can be obtained in 30 seconds in continuous or continuous-intermittent production and open heating?

A New Technique

A new technique that advanced rapidly during the war was the fabrication of products using the silver alloys and heat. In many instances great savings in machine time and a better product were obtained by joining stampings to stampings or stampings to castings with the silver alloys instead of machining a single intricate casting. In many cases the brazed specimen will withstand more abuse than a casting of similar cross section and weight. Threaded connectors or "what not" instead of being a part of a single casting, where accurate locating must be accomplished with jigs and fixtures, may be the product of an automatic screw machine and therefore relatively inexpensive. Stampings can be produced today with a high degree of accuracy and with great rapidity. Joining of the automatic screw machine part with the stamped piece is a matter of seconds usually, and is highly adaptable to continuous automatic machines using these heating techniques. The sample previously prepared with the correct amount of silver alloy at each joint leaves the heating unit completely assembled. Destruction tests usually indicate tearing of the parent metal elsewhere than the joint itself. Alloys of many different melting points are available making it possible to combine the brazing operation with annealing or hardening operations simultaneously, actually performing two operations in one automatic machine by planning the burner pattern to accomplish these results.

Just what does this mean to post war industry? We feel that it will mean a revision in manufacturing techniques for a great many products in order to meet competition that will probably be not only national but of international scope. Just as the last war produced an industrial revolution involving production techniques, the same effect may be expected after this war. Mechanization of heating processes in the manufacture of a product must become a part of the production line and of comparable speed of other machine tools in order to produce at maximum efficiency.

War Jobs of "Big" and "Little" Inch Oil Lines End

Petroleum Directives 63 and 73, scheduling the flow of crude oil through the "Big Inch" pipeline and petroleum products through the "Little Big Inch" pipeline, were revoked Nov. 30. Companies which supplied the pipelines are now free to move their oil as they see fit.

An offer to lease or buy these two lines will be outlined before the senate committee to investigate petroleum resources by a group of Texas independent oil and gas operators of the Independent Petroleum Cooperative Association. The prospective purchasers plan to use the "Big Inch" line to transport natural gas.

Employee Suggestion Plan

Public Service Co. of Northern Illinois has paid $1263 in two months to 104 employees for new ideas suggested to the company.

CORROSION AND PROTECTION

Of Buried Metallic Structures

Compiled and Abstracted by GUY CORFIELD, Technical Editor, GAS

Corrosion of Iron by Biological Oxidation of Sulfur and Sulfides

T. D. BECKWITH, department of Bacteriology, University of California, Los Angeles.

SULFUR is distinctly labile when exposed to the action of bacterial enzymes for it may be oxidized readily by some of them, and in turn, its compounds are subject to ready reduction by others. During the course of change in either direction, oxidation or reduction, certain products are formed and these either directly or indirectly induce corrosion of iron or steel if the metal lies in close contact with the site of bacterial activity. In order that these enzymatic functions of the bacteria may progress, environmental conditions must permit appropriate physiological activity by the microorganisms concerned. These backgrounds of conditions vary since the requirements for reduction differ radically from those requisite for oxidation.

Intense consideration has been devoted to the reduction of sulphates and other compounds of sulfur incorporating oxygen which give rise to hydrogen sulphide by microorganisms and the effects of this gas on submerged steel now are well recognized. The etiologic vibrios and the anacrobic surroundings necessary for their proliferation have been described in meticulous detail.

Much less attention has been given to the opposite side of the picture, namely oxidation of sulfur and sulfides with subsequent formation of sulfuric acid. It is this area of activity which it is proposed to discuss briefly at this time.

Waksman, (1) in a series of articles in 1922 demonstrated that certain bacteria readily can oxidize sulfur as a source of energy and that their distinctive by-product is sulfuric acid. They are highly aciduric since the resultant concentration of acid within a culture flask in which they are proliferating may become pH 0.8. Indeed a figure of pH 0.6 has been observed. Under natural conditions the acid as formed by them unites with any base immediately available in the soil to form sulfates, so that if iron or steel is present, it too is subject to attack.

These organisms are aerobic, autotrophic, and extraordinarily versatile as regards concentration of hydrogen ion; theoretically sulfur, oxygen, water and certain inorganic components constitute their sole metabolic requirements. Although non sporulating, they are moderately resistant to adverse conditions such as absence of optimal concentration of oxygen. Their habitat is soil which must be open to access of oxygen if they are to proliferate. The amount of sulfuric acid produced under favorable conditions by these bacteria is a function of the quantity of sulfur which is present, together with its area of surface. Obviously finely divided material will be oxidized more rapidly than will larger particles. That this process of oxidation of sulfur does proceed with accompanying expense of iron in the immediate vicinity will be indicated.

The accumulation of the products of corrosion of submerged iron or steel is composed largely of sulfides and among these FeS is important. Elemental sulfur is there likewise for the work of Winogrodsky (2) which deals with certain aspects of the bacteriology of soil forecasts its presence. Moreover, we have demonstrated 17% sulfur in certain instances in the heavy black incrustations both inside and outside of specimens of pipe examined. It is probable that so long as atmospheric oxygen is excluded at the site where the sulfur has been deposited by bacterial reduction from organic matter, this deposit remains almost completely unaltered. The black accumulation then contains not only sulfides among which FeS is prominent, but finely divided elemental sulfur as well. Moreover, bacteria which derive their energy by oxidation of sulfur and sulfides are present too. Under unfavorable conditions they are resting but when provided with more nearly optimal environment, they become functional. The author (3) has determined their presence in these deposits and has described in a previous publication the technique necessary for their isolation.

That these Thiobacilli can on occasion attack metallic iron may be demonstrated by the following experiment. A rude culture of the form implicated is started by inoculating 100 ml. of fluid culture medium with a fraction of a gram of fertile garden soil. To this culture is added 0.1 or 0.2 grams of fine iron wire. Incubation proceeds at 20° to 30°C. for a period approximating two months, and during this period the fluid in the culture flask becomes tinted dark brown while a similar culture to which no iron has been added

TABLE 1. OXIDATION OF FeS BY THIOBACILLI

	Immediate	30 *days*	60 *days*
Medium 5 with FeS	7.3	5.5	3.6
Medium 5 with sulfur	6.3	4.4	3.8
Medium 6 with FeS	5.9	4.1	3.2
Medium 6 with sulfur	3.4	2.9	2.3

TABLE 2. OXIDATION OF IRON PYRITES (FeS_2) BY THIOBACILLI

	Immediate	9 *days*	27 *days*	62 *days*
Medium with sulfur	6.2	5.3	4.2	3.8
Medium with FeS_2	5.8	5.5	4.2	4.2

TABLE 3. FORMATION OF H_2SO_4 FROM CHALCOPYRITE, MARCASITE AND PYRRHOTITE BY THIOBACILLI

	Immediate	5 *days*	42 *days*	54 *days*	*Final Controls*
Chalcopyrite	6.5	6.4	4.2	4.2	6.1
Marcasite	6.2	6.2	4.2	4.1	5.7
Pyrrhotite	6.5	6.2	4.3	4.1	6.2
Sulfur	6.4	6.3	4.1	4.1	6.1

remains colorless. If at the close of this experiment the iron wire be removed and its weight compared with its original figure, the loss will be determined to lie between 40% and 60% for the iron has been attacked by the sulfuric acid produced by the bacteria. A similar flask of culture medium containing iron wire but remaining sterile throughout the period of observation will yield no evidence of loss of the metal. If in a turn one desires to purify this culture in order that no extraneous organisms may complicate, then a pure culture of Thiobacillus will bring about results similar to those described above.

Another source of sulfur for energy for the oxidative processes of the Thiobacilli is immediately available in joint sealing mixtures which are advocated occasionally for pipe lines. Frequently these preparations contain larger portions of sulfur. If the soil is open so that both atmospheric oxygen and moisture are easily available, the sulfur may disintegrate. Not only is the joint destroyed ultimately in such instances but the metal becomes roughened as the sulfuric acid seeks a base for combination. This change was described by Beckwith and Bovard in 1937.

The black sulfide of iron, FeS, which appears so plentifully in the detritus closely adjacent to corroded iron or steel is readily available as a source of energy for sulfur-oxydizing bacteria as was demonstrated by an experiment described as follows. Waksman's fluid media numbers 5 and 6 were prepared in flasks, but in half of these flasks ground FeS was substituted for the sulfur usually incorporated. The amount of FeS added to these flasks was computed so that sulfur actually available was the 1% called for by the formula. These two series of culture flasks, one containing free sulfur and the other incorporating sulfur as FeS then were inoculated by addition of a small amount of fertile garden soil. Incubation proceeded at 30°C. As indicated in the following tabulation the hydrogen ion of these flasks was determined by means of a glass electrode. The increase in acidity was due to the proliferation of the Thiobacilli as was proven by subsequent subcultures. These results are set forth in Table 1, in which the numbers of the media refer to the formulae as published by Waksman. At the termination of this experiment, uninoculated flasks showed no indicative change in reaction.

The FeS is produced initially at the expense of the iron under one set of environmental conditions, but this FeS must not be considered to be particularly stable since if the surroundings subsequently alter by the lessening of the amount of water present so that air is permitted to enter, it in turn may be oxidized in part to form sulfuric acid and a shifting balance thus may eventuate. During a period of progress in either direction, reduction or oxidation, the state of the iron is subject to change induced by alteration in the state of the sulfur with which the iron is in contact.

Iron pyrites, Fe S_2, likewise is subject to attack by sulfur-oxydizing bacteria as is demonstrated by the following test. The method was similar to that described earlier for the experiment which deals with oxidation of FeS. Flasks of liquid culture medium of Waksman's formula 5 were prepared. They were then inoculated with small portions of garden soil, incubated at 25°-30°C. and the shift in hydrogen ion was determined by glass electrode. Following the final reading, confirmation was made according to methods described previously. The results are set forth in Table 2. Uninoculated control flasks did not change in reaction.

Fe S_2 is attacked by the organisms. The rapidity of action is less than on sulfur as was verified by a second series of tests which yielded results similar to those presented above.

In the field in one particular instance, the drainage from an area where iron pyrites occurred in quantity was evacuated through iron pipe. But it was noted that this pipe must be replaced at frequent intervals and that the drainage water was distinctly acid. Field studies demonstrated that oxidation of the iron pyrites by bacterial action gave rise to the acidity of the water and that without these bacteria, the mineral remained unaltered in culture media.

Tests on chalcopyrite, marcasite, and pyrrhotite with sulfur as a control have been concluded and the results are set forth in Table 3. For these there was utilized Waksman's Medium No. 5.

A similar series in which Waksman's Medium No. 6 constituted the formula for test was included but no positive results with the minerals other than sulfur appeared.

It is recommended that experts dealing with problems of corrosion of iron or steel in earth, make tests where possible to determine the presence and activity of organisms which oxidize sulfur and sulfides in a suspected area. It is probable that the reduction processes of the vibrio are economically more important to induce disintegration of metal than is the oxidizing metabolism of thiobacilli. Nevertheless there is good reason to believe that with the advent of favorable surroundings the picture of biological corrosion of steel becomes more complicated by the added activities of organisms which produce sulfuric acid. Further, there is evidence that these bacteria contribute directly to corrosion of iron in a region rich in certain sulfides when aeration is sufficient for proliferation. Finally, the sulfur content of the joint sealing compound which is utilized occasionally, by its microbiologic oxidation may contribute to the destruction of the metal with which it lies in contact.

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Effects of Aeration on the Hydrogen-Ion Concentration of an Anaerobic Soil

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RESULTS obtained by a number of investigators on the effect of air-drying of soils on their pH value are presented in this paper. The variations observed by these investigators may be considered negligible for most soils when compared to the change in pH value obtained on a sample of Papakating silty clay loam from a poorly-drained anaerobic site. Air-drying of this soil caused a change in hydrogen ion concentration from a neutral reaction to one of high acidity. The air-dried samples, when saturated and sealed in containers with complete exclusion of air, returned to the neutral condition. By air-drying the same samples again, the former low pH values were restored. By controlling the conditions of saturation and aeration this soil was passed through a complete cycle involving changes in pH values from neutrality, as found in nature, to one of high acidity, as observed in the air-dried state. These several changes are shown in Tables 1, 2 and 3.

TABLE 1. CHANGE IN pH VALUE ON AIR DRYING SOIL SAMPLE

Duration of test Days	*Sample* 1 *pH*	*Sample* 2 *pH*
0	7.2	7.2
27	—	6.2
38	3.7	—
41	—	4.2

The soil samples on which the studies were made were obtained from one of the sites at which corrosion tests are being conducted by the National Bureau of Standards. The site is located in Portage County, Ohio. A section of a pipe line on which severe corrosion due to the activities of sulfate-reducing bacteria has occurred traverses this test site. The soil was classified as Papakating silty clay loam. The samples were taken at a point where the water table is at the surface of the soil throughout the year; hence, the soil is completely saturated at all times, and drainage and aeration are very poor.

Representative samples of the soils which were used in this study were collected in one-quart clear-glass jars supplied with tight-fitting lids. The soil was covered with about two inches of soil water. It is not necessary to fill the jar completely to the top. It has been found that such procedure prevents air contamination and the container need not be previously filled with an inert gas. The samples at the Bureau have been kept in this condition for 2 years and 5 months, and even after having been opened on numerous occasions to remove portions of the sample, the pH value has not changed and is in agreement with field measurements.

The pH values were obtained with the Coleman pH electrometer, Model 3C, equipped with an inverted liquid junction especially adapted for making determinations of soils. A 1-to-1 soil-water ratio was used. During the measurements the calibration of the instrument was checked at frequent intervals against a standard buffer solution of known pH value.

Qualitative tests for the presence of sulfides gave positive results for the fresh soil, negative for well-aerated.

The results justify the association of the observed changes in pH values with the activity of anaerobic sulfate-reducing micro-organisms. These bacteria under certain conditions favorable to their growth have the property of reducing sulfates present in the soil to sulfides. Aerating the soil results in slow oxidation of the sulfides, and unless there are sufficient bases present, the soil reaction changes from neutrality to high acidity.

As a result of this study, it has been concluded that pH measurements of very poorly drained soils should be made only on samples maintained in the field condition because sulfate-reducing bacteria are most active in such soils when they are approximately neutral in reaction. Unless the pH of such soils is properly measured, the conclusion is likely to be drawn that corrosion due to sulfate-reducing bacteria in these soils is unimportant—whereas it may, in fact, be particularly severe.

TABLE 2. INCREASE IN pH VALUES OF THE AIR-DRIED SAMPLES UPON SATURATION AND EXCLUSION OF AIR

Duration of Test Days	*Samples moistened with distilled water* 1 pH	2 pH	3 pH	4 pH	*Samples to which sodium lactate solution was added* 5 pH	6 pH	7 pH
0	3.9	4.0	4.0	4.0	3.8	4.0	4.0
15	4.9	—	—	—	—	—	—
25	—	—	—	—	—	4.8	4.6
28	—	5.1	5.1	—	—	—	—
29	5.1	—	—	—	—	—	—
38	—	—	—	—	6.3	—	—
39	—	—	—	—	—	4.8	4.8
42	—	6.0	—	4.8	—	—	—
49	6.2	—	—	—	—	—	—
54	—	—	—	—	—	—	4.8
57	—	5.8	6.8	6.2	—	—	—
68	—	—	—	—	—	6.9	6.5
69	7.0	—	—	—	—	—	—
71	—	6.4	7.1	6.2	—	—	—
88	—	—	—	—	—	7.2	7.0
91	—	—	—	6.9	—	—	—

TABLE 3. EFFECT OF AIR-DRYING ON THE pH VALUES OF PREVIOUSLY SATURATED SAMPLES

Duration of Test	Sample number 1*	2	3	4	5	6	7
Days	pH	pH	pH	pH	pH	pH	pH
0	7.0	6.4	7.1	6.9	6.3	7.2	7.0
3	—	6.3	6.8	—	—	—	—
7	—	—	—	6.5	—	7.1	7.0
20	—	4.4	4.8	6.0	—	4.5	5.8
27	—	4.1	3.9	—	—	—	—
30	—	—	—	5.8	—	4.2	3.9
39	4.4	—	—	—	—	—	—
49	—	—	—	—	3.4	—	—
59	—	—	—	3.8	—	—	—

*The sample number corresponds to the same sample reported in Table 2. The pH values at 0 days in this table are the maximum values that the samples in Table 2 reached.

PROMOTIONAL NOTES and NOTIONS

By STANLEY JENKS

Boycott

Since I heard some months ago about a gas utility sales executive threatening a range manufacturer with all kinds of non-cooperative reprisals if he (the manufacturer) dared to ship an electric range into the utility's service area, I have heard similar stories from other places along the same lines.

In a nutshell, a certain school of thought in the gas industry has reached the remarkable conclusion that any range manufacturer who makes an electric range must be boycotted. In fact, one of the principal speakers at the A. G. A. Conference in October announced such a policy as a part of his own company's merchandising plans.

Of course, such a policy is both unfair and unsound. In fact, it is cockeyed, and, given industry-wide support, would be first-class evidence of a promotional mentality anticipating the worst. But, the really disturbing thing is the line of thought which could come up with such a decision. It shows no comprehension whatsoever of the manufacturer's position historically or economically.

A manufacturer has invested money, brains, and "know how" in his business to meet a demand for products, whether they be nutcrackers, nylon hose, or domestic cooking equipment. He knows—such is American production potential—that whether he makes it or not, the demand will be met. Therefore, to get his share of the business, he must be good, on his toes, and, if possible, a few steps at least ahead of his competitors.

Quality, which takes engineering and research, and mass production, which involves specialization, standardization, and modern assembly methods, are the bases on which he pens his hopes of getting his share and maintaining his place in the market.

Our gas range manufacturers, by and large, have done and are doing an outstanding job of insuring the cooking load for gas. Through the years, they have served the gas industry faithfully and well.

Also through the years, they have seen the electric appliance and equipment Goliaths creating and practically monopolizing a more profitable manufacturers' market than our manufacturers were enjoying in the gas field.

Let's be honest. There is a demand and a market for electric ranges, inferior as they are to the modern "CP" gas range. Do our boycotting friends propose to turn this market over exclusively to these electric giants without a penny stake in the gas industry? Aren't these competitors big enough, or must we help make them bigger? Surely, it is far smarter to let our own proven friends—manufacturers whose production is overwhelmingly weighted to gas ranges—drain away these profits for use in bettering our own needed products. Especially so, when so many of the body parts going into an electric range can be used advantageously in the gas range production line to reduce gas range manufacturing costs.

I think it can be categorically stated that, if the gas utility will lend its sole efforts to creating and maintaining a profitable market for high quality gas ranges, it need have no worry about the loyal ability of its range manufacturers to deliver the goods.

Sign of the Times

On the way to the office this morning, I saw a window streamer reading

47% ALL WOOL SOCKS

Yes, sir! The peace has still to be won, but we are at least making some steps toward normalcy.

Taxation

The war must be paid for and governmental expenses must be met, and every thinking American realizes that the money, directly or indirectly, must be created by hard work and self-sacrifice.

The gas industry, in all its branches, is carrying in common with all industry a terrific tax burden. My professional statistical friend tells me that in terms of operating revenue percentagewise, the manufactured gas industry in Federal income tax alone paid 6.4% in 1944, compared with 3.5% in 1940, and the natural gas industry jumped from 4.8% to 14.3% over the same period.

Burdened as it is in such a marginal business to earn the money to pay Uncle Sam, the real rub comes where it has to be earned in competition with tax-free publicly-owned utilities. Uncle Sam is bilked out of his money, and we, the general taxpayers, must perforce make up the deficit of service users in the Federal taxfree area. Add to this the unsound rate structures that generally are met in these areas, and it is a sorry picture indeed as far as the general public is concerned.

For the private competing utility, it is damned difficult. As Congressman Boren has already put it, there can be no fair talk about yardsticks until publicly-owned utilities are at least earning the equivalent of the federal income taxes they would be paying under private management.

Merry Xmas and a happier 1946!

CHASE NATIONAL BANK ANNOUNCES

Utility Appliance Financing Plan

A NEW plan for the financing of household electric and gas appliances has been developed by The Chase National Bank of the City of New York. Reflecting the increased interest in indirect consumer financing by banks, the step is significant in that this large commercial bank is prepared to participate through operating utility companies in this type of business.

Known as The Chase Confirmed Installment Paper Credit, the plan is available to utilities throughout the nation. It is equally adaptable to companies which will sell merchandise directly and to companies which will cooperate with dealers by helping them to finance their sales of appliances. It possesses a great deal of timely interest because the desire of utilities to build postwar load coincides with the vast reservoir of pent-up demand of their customers for both replacements and new household appliances, the cost of which, it is estimated, will run into billions of dollars.

The plan has been tailormade to fit the requirements of most utility operating companies. It is logical that such a plan was developed by the Chase, since this Bank has built up and maintained a completely integrated Public Utilities Department with operating engineers, lawyers and statisticians, during the past 15 years. For several years prior to World War II the Chase recognized the need for bank financing in the appliance field and it set up an organization to function along conventional finance company lines, but made available lower cost money, as it recognized the high credit of utility companies. World World II, of course, put an end to these activities.

The new Chase Plan provides for the establishment of a credit under which the utility company may receive advances at its election up to a dollar amount specified in the credit. There is no commitment fee for the credit and there is no obligation on the part of the utility company to borrow. The credit specifies a rate of interest firm for a year to be paid on the actual funds borrowed. Borrowings under the credit are repayable without penalty at the utility company's option. The utility company under this credit is required to hold its installment paper unencumbered in its portfolio and to make a monthly report to the Bank, on a form provided, of the total amount of paper owned by it, with a statement that not less than a specified amount comprises qualifying paper, together with a confirming statement of the amount owed to the Bank under the credit. Qualifying installment paper is defined under the credit to mean any evidence of indebtedness (conditional sales contract, leases, etc.) payable in not exceeding 48 approximately equal monthly installments, of which not more than two such monthly installments are in arrears.

The same monthly report provides a space for the utility company to apply for an advance, which within the limits of the credit may be for the face amount of its eligible paper held (including the finance surcharge). It makes no difference to the Bank whether such paper arises from the sale of merchandise by the utility company or whether the merchandise has been sold by dealers as long as the utility company owns the paper.

There is no pledge of installment paper by the utility company and the utility company is obligated to repay (except under termination of the credit) only when it is necessary to reduce the unpaid balance of the advance to the face amount of qualifying installment paper owned by the company. Thus the credit remains in effect from month to month and may continue from year to year until terminated.

No promissory notes are required for advances. Until the credit is terminated, the company may elect to use all or any part of the funds available to it, but upon termination by either party the company has the right to elect the privilege of repaying its remaining balance due the bank in consecutive monthly installments over a period not exceeding three years from such date of termination.

The Chase credit is automatically renewable unless and until either the utility company or the bank gives notice of termination as of any anniversary date. The conditions of the credit continue in force after termination for the period of repayment except the right to apply for new advances.

A great many utility executives believe that the utility company is the best judge of its customer's credit and that the company's regular billing and collection departments can service the paper most economically. The acquisition of installment paper, whether direct or through dealers, permits the company to exercise reasonable surveillance over the type and quality of appliances offered to its customers, and since the company is primarily interested in maintaining satisfactory customer relationships and in promoting the sale of its services, it may direct its collection efforts with this in view. By reason of its recognized credit standing, the company can obtain the necessary funds to carry this paper on a low cost basis. It can obtain under the Chase Plan not only the cash sales price of the appliance, but the finance surcharge, it need not utilize any of its normal working capital, its ordinary credit line should not be curtailed, and with adequate surcharge it can obtain funds which should cover in advance all costs of billing and collection and losses arising through repossession.

To summarize, it would appear that the Chase Plan has several outstanding features; assurance of a firm rate for low-cost money, continuous availability of funds, no notes, no pledge of paper and one simple monthly report made up from information easily obtained from company records. It provides a simple, direct, and economical credit to stimulate and broaden the sale of gas and electric appliances, which combines practical simplicity and low operating cost.

GAS AIR CONDITIONING

A Summary of Field Experience Brought Up-to-Date

By W. F. FRIEND

Mechanical Engineer, Ebasco Services, Inc., New York City

EXCERPT FOM "Technical Advances in Gas Summer Air Conditioning"—A Report by Joint Committee on Gas Summer Air Conditioning of the Industrial and Commercial Gas Section and Residential Gas Section, John de B. Shepard, Chairman. Published by American Gas Association, 1945.

AFTER the Association Laboratories completed the technical investigation of equipment for comfort air conditioning with gas, results were published in Research Bulletin No. 18. The testing work and analysis were thorough, the presentation was clear, and the findings were convincing. Comments from men in the air-conditioning industry at large have been wholly favorable. The Bulletin is considered a classic in its field, and it should be a valuable aid to establishing public confidence in the gas industry's leadership in post-war development of residential air conditioning and the allied small-commercial market.

Supplementing the investigation of design features and operating characteristics, based on models submitted by manufacturers for comprehensive tests, the Laboratories undertook a survey of field experience acquired with existing installations. About 20 gas utilities were asked to fill out data forms distributed under Joint Committee auspices, dealing with investment costs, gas and electric consumptions, cooling water requirements, general performance, servicing requirements, and customer satisfaction. A summary of replies was compiled, but the Committee decided that further study of field conditions and inclusion of any obtainable 1943 performance data would be advisable, before making the results public.

Summary of Findings

Main conclusions from the field data and supplementary sources are:

1. Investment cost for air conditioning installations is still comparatively high—between $2000 and $2500 for complete year-round system with cooling-tower for water supply to serve a 6 to 8-room, residence; if low city-water rates permit omitting tower, cost is about $300 less.

2. Reduction of cost to $1500 level, now set as the immediate objective, will require not only quantity production of equipment, but also simplification of field installation methods and the introduction of lower-cost "alternate" materials.

3. Factory price of equipment, including cooling tower, together with transportation charges, represents 40 to 60% of total cost; air ducts and grilles with thermal and acoustical insulation where required on ducts, account for 20 to 35%; these items generally determine the overall installation cost.

4. Gas consumption by 5-ton year-round installation serving an average house is usually between 200 and 250 Mcf annually (1000 Btu per cu. ft.); in the South, ratio of quantities for cooling and for heating is around 3 to 1 and in the North 1 to 4 or even lower.

5. For residential installations, the gas usage by all-year air conditioning is between 4 and 5 times that attained by all-gas service for the 3 major domestic appliances, i.e., cooking range, water heater and refrigerator.

6. Electric consumption by 5-ton residential gas air conditioning installation with cooling tower is 3000 to 3500 kwh annually in the South and around 2000 in the North; cooling tower contributes slightly over half the consumption in the South and less than one-third of annual energy used in the North.

7. There is wide variation in gas and electric consumptions by individual residential installations; in some cases the quantities are as little as 20% of average, and in others as much as 150%. Many causes are involved, some of them unpredictable and changing from one year to another, and usually related to the "human element."

8. Small commercial installations show even greater variation than residential, as they embrace such differing requirements as 24-hour 7-day lunch rooms with high internal heat load at one extreme, and 7-hour 5-day private offices with small internal load at the other; however, group averages indicate investment costs about 20% lower than normal residential, and energy consumptions 10 to 15% less.

9. Revenues derived from air conditioning load, as reported on survey sheets, are at rates for the consumption incremental to customer's other load, between 40 cents and $1.05 per Mcf of 1000 Btu gas (4 cents and $.105 per therm) with majority of installations within range 45 to 65 cents; electric rates are 1.5 to 4.5 cents per kwh, with majority between 2 and 3 cents.

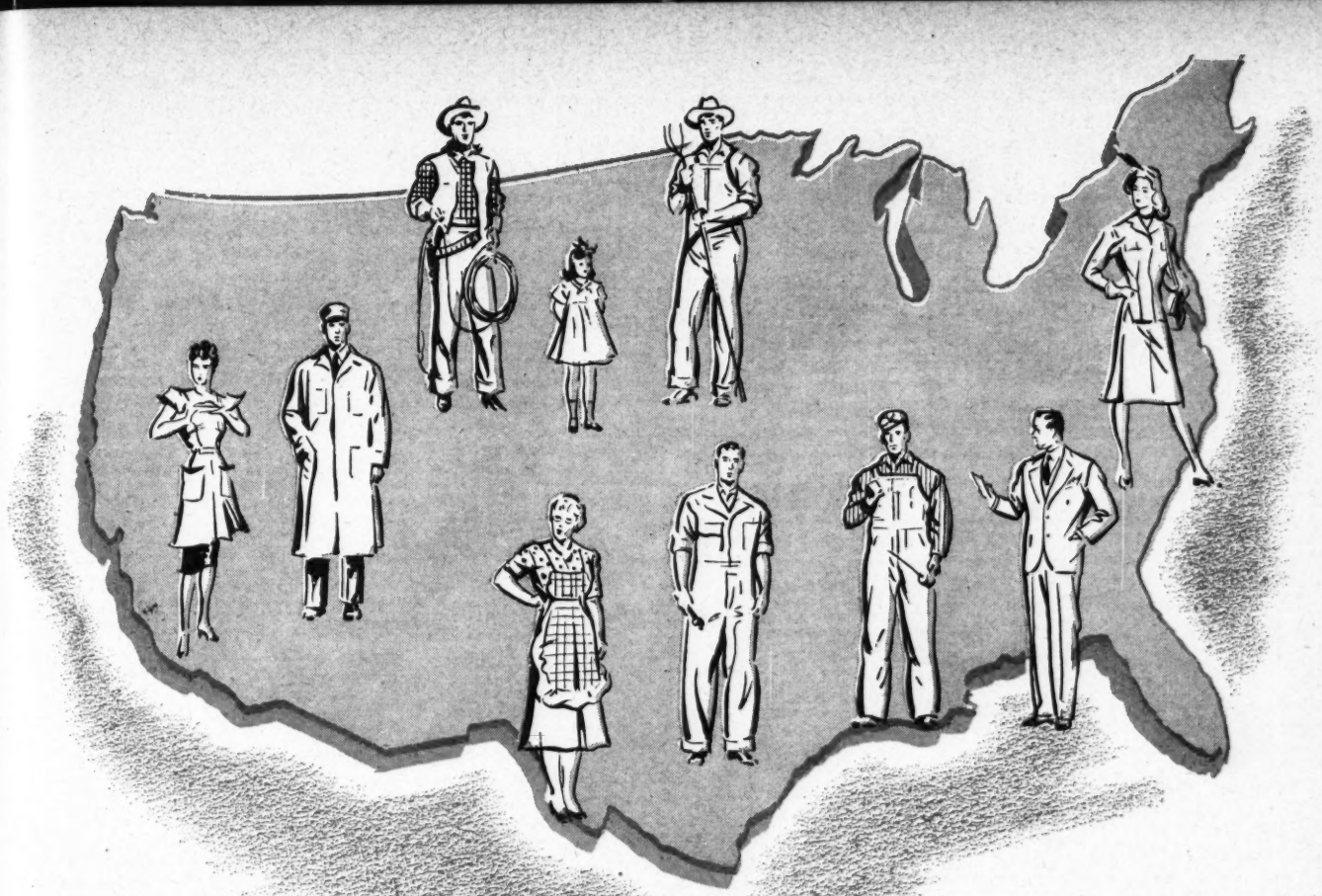
10. Servicing difficulties are receiving close attention by utility companies and equipment manufacturers; some "modernization programs" have already been completed and others are awaiting release of critical materials; these and other measures are eliminating whatever weaknesses have been disclosed by field experience; already, it is practicable to institute servicing contracts acceptable to customers, which will make routine maintenance a self-supporting activity.

11. Statements secured from owners and users are evidence of good reputation established by gas air-conditioning equipment and good will obtained by the sales and servicing departments of utility companies and equipment manufacturers; owners are recognizing and making due allowance for newness of designs and for handicaps imposed by wartime limitations.

12. Compared to status reached in comparable development period by older mechanical and electrical apparatus, such as the automobile, radio, household refrigerator, the technical advance and public acceptance attained by gas air conditioning since it started to gain momentum in the late 1930's, have been quite creditable and provide a sound foundation on which to build for the future.

WATER HEATING SIZING ARTICLE TO BE REPRINTED

A number of requests have been received from utility companies and manufacturers for reprints of the article, "How to Size and Install Automatic Storage Gas Water Heaters," which appeared in the November issue, for distribution to their dealers. Reprints will be available at 10c each, or in quantity at special prices. Those desiring reprints should send in an order immediately to GAS, 1709 West 8th Street, Los Angeles 14, Calif.



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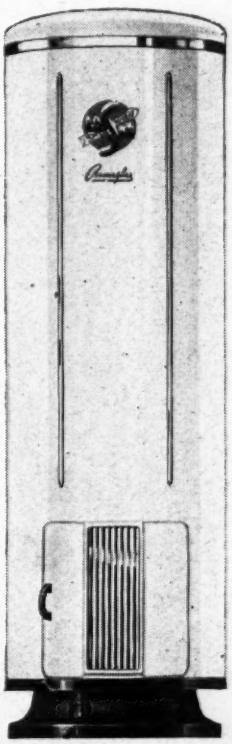
Hot water, as sparkling clean as its source.



SMITHway *Permaglas* WATER HEATERS

A. O. SMITH Corporation

THE SALES FRONT

• **The Blue Flame Merchandising Council** of Dallas, Texas, made up of gas appliance manufacturers' representatives and sales executives of gas utility companies, has been organized for the exchange of ideas in connection with the merchandising of gas appliances, to collect and disseminate information of benefit to its members regarding various phases of gas appliance merchandising, to promote acquaintance, good fellowship and closer business relationship. President of the new Council is **Fred D. Bradley, Southern Union Gas Co.** At luncheon meetings programs consist of round table discussions regarding the various phases of utility merchandising.

• A contest for the design of the "Gas Range of Tomorrow," involving 16 cash awards totaling $18,000, will be conducted by the **American Stove Co.,** S. E. Little, vice president, has announced. It will be sponsored by "Architectural Forum, with George Nelson, of the American Institute of Architects, as professional advisor.

The cash awards are broken down as follows: 1st prize, $5000; 2nd prize, $3000; 3rd prize, $2000; three prizes of $1000 each; and 10 prizes of $500 each. The contest opens in November and closes March 1, 1946.

The competition booklet, which also incorporates the basic technical data required in initiating a design, may be obtained free of charge by writing to George Nelson, A.I.A. c/o "The Architectural Forum," Department P-3, Empire State Building, 350 Fifth Avenue, New York 1, N. Y., mentioning the Magic Chef design contest.

• The following sales policy of **Consolidated Edison Company of New York, Inc.,** has been announced by E. F. Jeffe, vice-president in charge of sales:

"It is the stated policy of this company that purchases of electric and gas appliances and equipment as displayed on the showroom floors of the Consolidated Edison Company of New York, Inc., and as are included in our Co-operating Dealer Plan, will not be purchased through any company medium for any employee at a discount.

"This policy is to be strictly adhered to by all employees, supervisors and executives."

Kitchen Specialists in the Making

SCHOOL has opened at the plant of the American Central Manufacturing Corp. for distributor representatives, who will sell the all-steel kitchen sinks and cabinets shortly to start rolling from the production lines of the Connersville, Ind. concern.

First "class" to respond to the ringing of the school bell got under way Sept. 11, contained American kitchen distributors from such widely separated points as New York, Pittsburgh, New Orleans, and Grand Rapids, Mich.

Each of American Central's four score distributors has been invited to send a member of his sales force to the factory for an intensive 4-day course of "sprouts" designed to make him a full-fledged kitchen specialist. These men in turn will be capable of training dealers back home in the fine points of kitchen planning and installation.

Divided into morning and afternoon sessions, the instruction includes classroom lectures, blackboard "skull practice" and laboratory workouts with actual kitchen equipment. Motion pictures, slide films, charts, and equipment displays are freely used to round out the training program.

To "graduate," the students must solve four kitchen layout problems. Successful in this final exam, the candidates receive diplomas as duly qualified "kitchen specialists".

• "Let's Plan a Peacetime Home" is a 114-page book published by **Surface Combustion Corp.** for the family thinking about building or remodeling a home. The book discusses functional planning, how to plan rooms, architectural styles, kitchen planning, arrangements for making household duties simpler, and one of the sections has helpful advice on the business side of building a house. Cost: $1.00.

• Youngstown Kitchens' **(Mullins Manufacturing Corp.)** post-war models were displayed for the first time distributors met November 15 and 16 at the headquarters plant in Warren, Ohio. Approximately 150 representatives from 57 distributing firms viewed the kitchen equipment in full production.

A complete merchandising program, with all dealer helps, advertising, literature, and sales training material were presented at the session. Already 208 distributor men have attended three-day training schools.

Youngstown Kitchen's new models will reveal many changes in style, a great number of improvements, and 23 additions to the line, sales executives say.

• **The Aviation Corp.,** 420 Lexington Ave., New York, shortly will begin large-scale production and marketing of new gas and electric kitchen ranges as part of its peacetime reconversion program, it was announced recently by Irving B. Babcock, president.

Both Avco gas and electric designs are equipped with high-level broilers. Special features of some models of the stove include processed distribution of heat, interchangeable parts, and a one-piece "waterfall" top which rises 18 in. to facilitate the cleaning of burners.

• **The Foxboro Company** of Foxboro, Mass., has prepared a little "Welcome" folder which is handed to callers at the reception desk. The folder presents a map and brief history of the town of Foxboro, carries transportation timetables between Foxboro and key cities in the surrounding area, and outlines in general the company's activities.

• **The Cleveland Heater Co.,** 3210 Superior Ave., N. E., Cleveland, announces "The Service of Selling" by Kenneth Lawyer, a two-volume set covering every important problem in personal selling and written for the home appliance salesman. The volumes, entitled "The Principles of Salesmanship" and "The Selling Process" cost $4.00.

• **Servel, Inc.,** Evansville, Ind., released recently to gas utility companies and other distributors, an ad on the new Servel Refrigerator which is now in production. Mats on the ad are offered in two, three, and five-column sizes. Additional ad mats are available at this time.

• **The Atlanta (Ga.) Gas Light Co.** recently published a dealer booklet "The Magic Flame That Will Brighten the Future of Your Business," setting forth post-war plans and policies in relation to company cooperation with dealers.

Consolidated Edison To Spend $120,000,000

Installation at the Hunts Point gas manufacturing plant in the Bronx of a liquefied petroleum gas plant which will increase the production facilities by about 10 million cu. ft. a day, or 12½%, is part of a $120,000,000 expansion program planned by Consolidated Edison Co., New York, to enlarge gas and steam production facilities and reinforce and extend distribution systems for electric, gas and steam services. The installation will consist of 14 storage tanks of 25,000 gals. capacity each and is expected to be completed before the high demand for gas during the cold spells of the coming winter.

Louisiana Reserves Placed At 15.9 Trillion Cu. Ft.

The first comprehensive report of Louisiana's natural gas reserves has been compiled in a survey conducted by the State Department of Conservation with the total set at 15.9 trillion cu. ft.

North Louisiana's reserve is listed as 5.3 trillion cu. ft., while that for South Louisiana is 10.6 trillion cu. ft. The total is conservative because many operators failed to file information on all known gas, and casing-head gas was not considered in the report.

Natural Gas from Ohio Fuel To Reach Bellefontaine

Bellefontaine, Ohio, now served with manufactured gas, will purchase natural gas for distribution through its system at wholesale from Ohio Fuel Gas Co. FPC has authorized Ohio Fuel to lay the necessary lines which will include 93,500 ft. of 5-in. line to the municipal limits and a gas pressure and measuring station near the corporate limits of the city. In addition, a 6-in. line reaching to the city's present gas-manufacturing plant is to be constructed by the company and later owned by the city. The entire cost of the project will be $126,740 and it will result in a saving to consumers of about 10% yearly.

Continuation of PIWC Activity Considered

Although the Petroleum Industry War Council theoretically ceased functioning Oct. 24, a special committee of 23 members has been named to consider continuing a cooperative industry activity. Members seem to feel that the Council's activity is worth continuing since it has operated beneficially for both the government and the industry, and has assisted both large and small companies in many problems. A report is expected Dec. 11.

Universal Gas Range Flown to London

Cribben and Sexton Co., Chicago, manufacturers of the Universal gas range, announce that a Universal range comprised the bulk of 500 lbs. of freight carried on the first American Airlines flight from Chicago to London on Nov. 19. The range was consigned to the British Ministry of Supply.

George D. Wilkinson, president of Cribben and Sexton, said at the christening ceremonies: "It is significant to note that a gas range, typifying America's most modern cooking service, has been included in the cargo of this flight which is a forerunner of America's newest field of endeavor for world trade and good neighborliness."

Eden, Texas Buys Gas System

Eden, Texas, has voted bonds to purchase the gas system from Ed Strentz and Glen Porter for $50,000. The system, which now suppiles 400 customers with natural gas from a well drilled by the Northern Ordnance Co. 30 ft. from the city limits, will be taken over by the city on Jan. 20, 1946.

Union Producing Expands

Union Producing Co., Shreveport, La., moved toward further development of its postwar expansion plans with the opening of a new district office in the Manziel Bldg., Tyler, Texas, to supervise porduction operations in the East Texas area. M. W. Ransom, former superintendent of the oil transportation department of the company, has been named manager.

Initially, the activities of the new district will comprise administrative land and lease, and geological functions of the company, the announcement stated.

Industrial and Commercial Gas Conference in Toledo

The 1946 American Gas Association Conference on Industrial and Commercial Gas will be held in Toledo, Ohio, Thursday and Friday, March 28th and 29th, at the Commodore Perry Hotel, according to Harry A. Sutton, chairman. The object of the conference is to aid the industrial and commercial branches of the gas industry in the continuance of their efforts to have services rendered by the gas industry used most extensively and efficiently during the reconversion and postwar periods.

J. P. Leinroth is chairman of the A.G.A. Industrial Gas Section.

Portland Leases 2000 Acres For Richfield Oil Tests

Richfield Oil Corp. has been granted a lease on 3000 acres of county-owned land near Portland, Ore., on which it plans to drill within a few months. The lease provided for a similar agreement with the city for leasing 2000 additional acres in the Portland hills and also provides that the company commence operations within 60 days after signing the second agreement, drilling on either the city or county land. Richfield expects to begin preliminary operations for drilling around Feb. 1 with actual spudding scheduled for about March 1.

Maryland Utility Opens New Headquarters

Cumberland & Allegheny Gas Co. established headquarters recently in its new three story building at 149 Baltimore St., Cumberland, Md.

The new building houses this natural gas company's commercial business office, home service auditorium, merchandise display floor and facilities for the sales department. It is also the headquarters for Carl C. Robbins, district manager.

Moving these natural gas operations from the former North Mechanic St. location to Cumberland's leading business street has not affected the company's shops and service groups, which will continue to operate at their present location.

Fluorescent illumination and pastel-toned walls contribute to a cheerful atmosphere in the Cumberland and Allegheny Gas Company business office recently opened at 149 Baltimore St., Cumberland, Md. An innovation is the customer service desk—shown at the extreme left—built in as an integral part of the counter where gas bills are paid.

People Natural Gas Increases Storage

Reserve storage facilities of The Peoples Natural Gas Co. in Pennsylvania have been increased to more than 4.5 billion cu. ft. during the past summer to prevent repetition of the natural gas shortage of last winter, according to E. M. Borger, president of the company. The Peoples customers now use more than twice as much natural gas as they did 10 years ago.

This is an increase of about one billion cu. ft. over available reserves last winter when industrial demands for war production and the diversion of gas from Peoples' territory by the government caused temporary curtailment of adequate supply. People's West Virginia supplier, The Hope Natural Gas Co., also has increased its gas in storage by some eight billion cu. ft.

About $1,750,000 has been invested by Peoples in five underground storage pools now in use, and in gas inventory. All are located near the main transmission lines of the Peoples system so they serve not only western Pennsylvania but Peoples customers in communities as far east as Johnstown and Altoona.

At the beginning of the winter season an estimated total output of 80 million cu. ft. a day is possible from the five storage pools which augment supplies delivered directly from producing wells in the area and in West Virginia and Texas. Pipeline capacities are not sufficient to deliver the total requirements for extremely cold winter days.

Milwaukee Gas Light Seeks Purchase of Coke Company

The Milwaukee Gas Light Co. has applied to the Wisconsin Public Service Commission for permission to issue stock for the purchase from American Light and Traction Co. of the Milwaukee Solvay Coke Co. The gas company has submitted evidence to show that if Milwaukee gets natural gas it can utilize the coke plant for standby purposes. With the city using natural gas, the coke plant will produce 11 million cu. ft. of oven gas daily which can be resold to the city's sewer commission or enriched with liquefied petroleum gas for distribution with natural gas.

Milwaukee Gas Light proposes to reduce the par value of its stock from $50 to $12 a share and to issue 362,828 shares of the new stock to the American Light and Traction Co. for its shares of Milwaukee Solvay Coke Co.

Architects to Judge American Stove Co. Contest

Architectural Forum has named four leading architects and designers and one home economics expert as judges for the American Stove Co.'s $18,000 Magic Chef gas range design contest. They are Peter Schladermundt of Van Doren-Nowland & Schladermundt, New York; Edward D. Stone, New York; Samuel A. Marx, Chicago; Gardner Dailey, San Francisco; and Elaine Knowles, New York.

Registration for entry is made through George B. Nelson, care of Architectural Forum, Dept. P-3, 350 Fifth Avenue, New York. A booklet outlining contest rules and the basic technical data required to enter a design is forwarded to all registrants.

PEMCO Name Changed to Rockwell Manufacturing Co.

Col. Willard F. Rockwell, chairman and president of Pittsburgh Equitable Meter Co., recently announced that the company's name will be changed to Rockwell Manufacturing Co. due to greater diversification of manufacturing activities resulting from recent acquisitions. Subsidiaries of Pittsburgh-Equitable will continue as subsidiaries of Rockwell Mfg. Co. Rockwell said plans for expansion involve spending several million dollars.

A.G.A. Pamphlet Features "New Freedom" Gas Home

The American Gas Association has published a promotional pamphlet entitled, "Open the Door to a New World of Ease and Convenience," which will appear as an 8-page insert in the next issue of "Home Owner's Catalog," circulation 70,000. A press run of 100,000 additional copies for sale to companies was completed Nov. 23. Copies may be obtained from the Committee on National Advertising, American Gas Association, 420 Lexington Avenue, New York 17, N. Y.

National Coffee Association Offers Brewing Booklets

The National Coffee Association, New York City, in cooperation with the American Gas Association and C. George Segeler, has prepared two booklets giving instructions for the proper brewing of coffee in the home and in the restaurant. The booklets are distributed by the Pan-American Coffee Bureau and copies may be obtained from J. Rosenthal, Executive Director, Joint Coffee Promotion Committee, Room 730, 120 Wall Street, New York 5, N. Y.

Unions Ask 30% Raise

The Utility Workers Organizing Committee, acting on behalf of the 10 Gas company locals, made a demand to the Southern California Gas Co. last month for an overall general wage adjustment of 30%.

Until they have had an opportunity to study the demand and discuss the matter with Union representatives, Management representatives declined to make a statement.

Canadian Meeting Set

The Canadian Gas Association has announced that its 39th meeting will be held at the Manoir Richelieu, Murray Bay, Quebec, on June 18-21, 1946. W. H. Durgy, division superintendent, Dominion Natural Gas Co., Ltd., has been named chairman of a Papers and Speakers Committee.

Russia's Longest Pipeline To Supply Moscow

Stearns-Roger Manufacturing Co., Denver, and General Iron Works are among a number of U. S. companies supplying the specifications and machinery for four key processing plants to keep natural gas from rich fields on the Volga flowing freely through Russia's longest gas pipeline, from Saratov to Moscow. When completed, the $20,000,000 450-mile pipeline will furnish fuel for Moscow's homes and industrial expansion at the rate of an estimated 60 million cu. ft. of gas every 24 hours.

T. A. Crawford to Lead Indoor Climate Institute

At the second annual meeting of the Indoor Climate Institute recently held in Detroit, T. A. Crawford, general manager of Timken Silent Automatic Division, Timken-Detroit Axle Co., was elected president succeeding Paul B. Zimmerman. L. N. Hunter of the National Radiator Co. was made 1st vice president; R. E. Moore of Bell & Gossett Co. and E. N. McDonnell of McDonnell and Miller, were re-elected secretary and treasurer respectively.

New Fuel Dept. to Supply All of System Companies

The Consolidated Edison System Companies have formed a fuel department, headed by R. E. Dennis, to purchase all coal and oil for the System, to supervise its transportation to company stations or stockpiles, and to sell all by-products produced in gas and electric manufacturing. Dennis will purchase and deliver all System coal and oil requirements, which represent one of their largest operating expenses, and will supervise selling the coke, tar, light oils and ammonium sulphate.

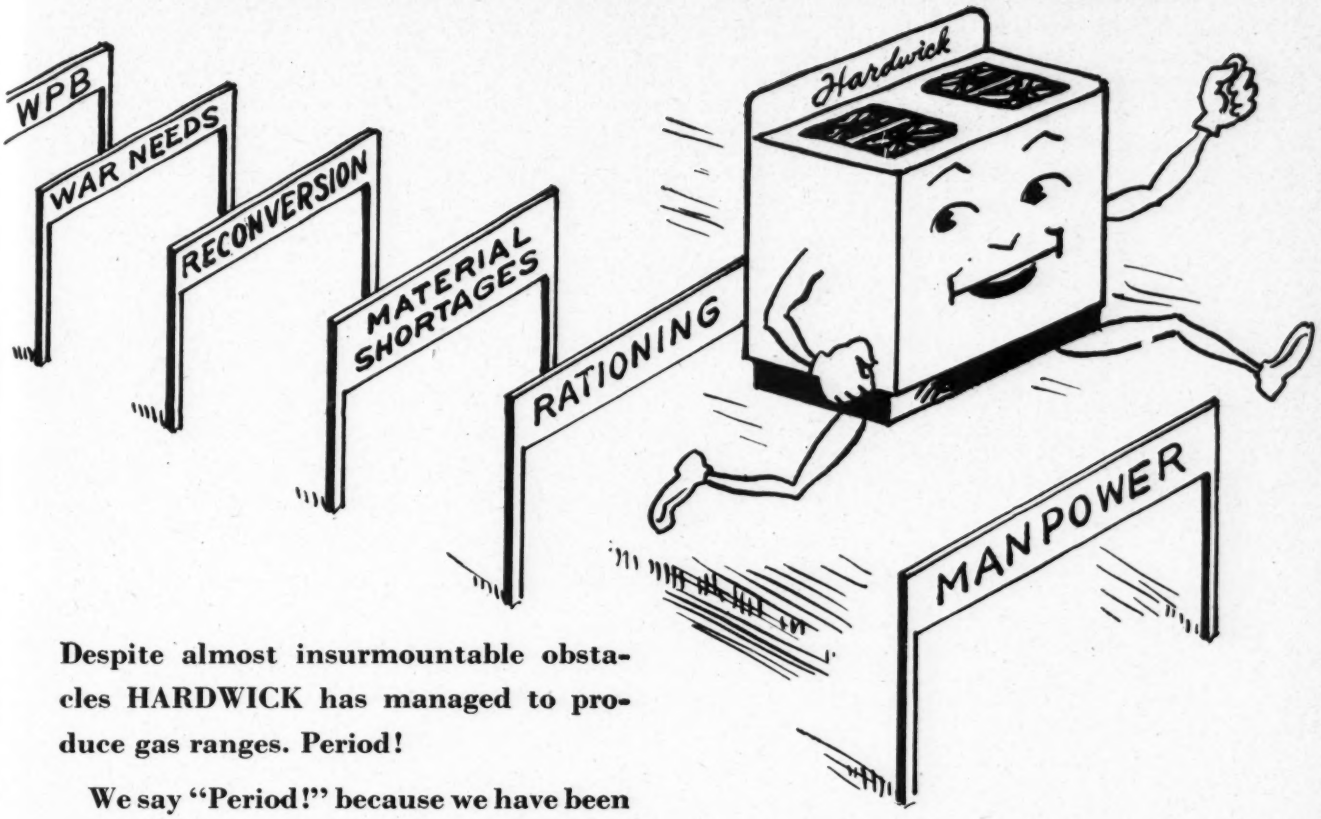
New Natural Gas Main Installation in Operation

The Peoples Gas, Light & Coke Co., Chicago, has completed a new natural gas main which makes the gas available at all stations, where it is reformed and mixed for delivery to the company's distribution network. The new installation has increased by more than 80 million cu. ft. the available supply of 800 Btu gas to meet growing demands. The project was complicated by the presence of the Chicago River and part of the line is now laid in a company-owned tunnel under the river.

Humble Pipeline Co. Starts Airplane Pipeline Patrol

Humble Pipeline Co., Houston, recently inaugurated its first airplane pipeline patrol over part of its network of lines. Looking out the window of his small Luscombe plane at 500 ft. or lower, the pilot inspector will inspect the grounds over the pipelines for telltale oil spots and other disturbances requiring repair crews. The pipelines have been plotted on flight maps so at all times the pilot will know where he is in relation to the nearest pipeline pump station.

HARDWICK'S HOPPIN' HURDLES!



Despite almost insurmountable obstacles HARDWICK has managed to produce gas ranges. Period!

We say "Period!" because we have been unable to turn out enough ranges to keep everybody happy.

We don't believe a combination magician and mathematical genius could do a much better job of dividing our production more fairly. The fact remains, however, that there are not enough ranges to go around to satisfy all demands. So we'll have to "sweat it out" for a while longer until production can be built up.

Your patience and understanding during these critical times have been marvelous. It is an inspiration to do an even better job over the months ahead.

Again let us say "thanks a million for your orders and your patience."

We cordially invite you to see the modern* HARDWICK *Line at the Winter Show of the Home Furnishings Market, Space 1530-31, American Furniture Mart, Chicago, Illinois.

HARDWICK Gas RANGES

HARDWICK STOVE COMPANY • Cleveland, Tennessee, U. S. A.

ASSOCIATIONS

A.G.A. Sub-Committee On Gas Copy Meets

The A.G.A. Sub-Committee on Approval of Domestic Gas Copy met in St. Louis Nov. 14 and 15 with J. J. Quinn, chairman, presiding. Joining the meeting were consultants to the Committee, six staff members of the New York office of McCann-Erickson and three representatives of the Laclede Gas Light Co.

Some of the subjects on the agenda were: current publicity activities, readership ratings of the national ads for the first six months of 1945, report on tests of kitchen color combinations, discussion of the CP trade-mark, progress report on the proposed New Freedom Gas Kitchen booklet, discussion of policy on developments in kitchen ventilation and a report and discussion on radio.

The Committee was of the opinion that the present campaign, including the New Freedom Gas Kitchen ads, is one of the most effective developed in the nine years of national cooperative advertising in behalf of gas fuel and gas appliances.

A.G.A. Personnel Conference Holds Sixth Meeting

The A.G.A. Midwest Personnel Conference held its 6th meeting in Kansas City on Nov. 8 with R. B. Harkins, personnel director, Panhandle Eastern Pipe Line Co., as chairman.

C. C. Jolley

Upon the resignation of Harkins, who first organized the group, as chairman, C. C. Jolley, personnel director of the Natural Gas Pipeline Co., Chicago, and H. F. Voertman, assistant vice-president, The Laclede Gas Light Co., St. Louis, were elected chairman and vice chairman respectively.

Considerable time was devoted to the reporting and discussion of union contract developments of the companies represented at the Conference which centered on the problems involved in returning to a normal work week.

At the afternoon session Gerald Cole, Veterans' Training Officer of the Veterans Administration, outlined the operations of the government's vocational rehabilitation program for veterans under public laws 16 and 346—"G. I. Bill of Rights," and answered a number of questions raised concerning company responsibilities, etc. It was stated the demands of veterans is creating the necessity of company participation in the program in the interests of public relations.

M. E. Jones, chief of Veterans Replacement of the United States Employment Service, explained the operations which attempt to place the returned veterans in a job to the interest of both employer and veteran. Jones stated that in face of numerous magazine and press articles, the great majority of returning veterans are mentally and physically equipped for employment.

The remainder of the meeting was devoted to a discussion of specific problems on such matters as merit rating systems, handling of returned veterans, employment of married women, etc. It was agreed the Conference suggest to the incoming chairman that the next meeting be held Jan. 8 in Omaha.

Industrial Section Urges Use of Trend Chart

J. P. Leinroth, chairman of A.G.A. Industrial and Commercial Gas Section, reminds members that a considerable sum has been invested in the trend chart which has appeared in advertisements for a decade or more. Styles, layouts and copy approaches have changed, but the use of the chart continues on an ever-widening scale. All companies are urged to use the trend chart in their gas advertising. Information or reproduction proofs and electros may be obtained from Ketchum, MacLeod and Grove, Inc., 411 Seventh Ave., Pittsburgh.

A.G.A. Technical Section Conference Dates Set

Lester J. Eck, vice president, Minneapolis Gas Light Co., chairman of the Technical Section of the American Gas Association, announced recently that arrangements were made by the Gas Production, Chemical, Distribution and Motor Vehicle Committees, to hold their Annual Conference as follows:

Distribution and Motor Vehicle Conference, Hotel Stevens, Chicago, April 16, 17, and 18, 1946.

Joint Production and Chemical Committee Conference, Hotel Pennsylvania, New York City, June 3, 4, and 5, 1946.

Joe Mulcare New Mayor of Gild of Ancient Supplers

During the A.G.A. convention in New York, the Gild of Ancient Supplers elected Joe A. Mulcare as Mayor for the coming year, succeeding C. Edwin Bartlett of Philadelphia. Mulcare is head of Mulcare Engineering Co., New York City, and has been Senior Warden for the last two years.

Other officers elected are: Senior Warden—Frank C. Packer, Payne Furnace Co., Beverly Hills, Calif.; Alderman—Joseph A. Messenger, Buell Engineering Co., New York City; Wayne H. Smith, Continental Water Heater Co., Glendale, Calif.; and E. Carl Sorby, Geo. D. Roper Corp., Rockford, Ill.; Clerk—John Van Norden, American Meter Co., New York City; Keeper-of-the-Treasure—Glenn H. Niles, Ridgewood, N. J.

CALENDAR

December

National Association of Railroad and Utilities Commissioners—Miami Beach, Dec. 4-7.

Interstate Oil Compact Commission Meeting—Allis Hotel, Wichita, Kansas, Dec. 13-15.

January, 1946

American Gas Association Southwest Personnel Conference — New Orleans, Jan. 11.

New England Gas Association Operating Division Meeting — Salle Moderne, Hotel Statler, Boston, Jan. 17.

Federal Power Commission's Natural Gas Investigation Hearing—Houston, Texas, Jan. 28. Changed from Nov. 27 at Dallas.

Independent Natural Gas Association Annual Membership Meeting—Texas State Hotel, Houston, Jan. 28.

February

National Metal Congress and Exposition—Cleveland, Feb. 4-8.

Federal Power Commission's Natural Gas Investigation—Biloxi, Miss., Feb. 11.

Federal Power Commission's Natural Gas Investigation—Chicago, Feb. 19.

March

Federal Power Commission's Natural Gas Investigation—Charleston, W. Va., March 19.

Southern Gas Association—Galveston, Texas, March 21-22.

American Gas Association Conference on Industrial and Commercial Gas Section — Commodore Perry Hotel, Toledo, March 28-29.

April

American Gas Association Distribution and Motor Vehicle Conference—Hotel Stevens, Chicago, April 16-18.

Mid-West Gas Association (place to be selected) April 8-10.

May

National Association of Corrosion Engineers Annual Meeting — President Hotel, Kansas City, Mo., May 7-9.

June

American Gas Association Joint Production and Chemical Committee Conference—Hotel Pennsylvania, New York City, June 3-5.

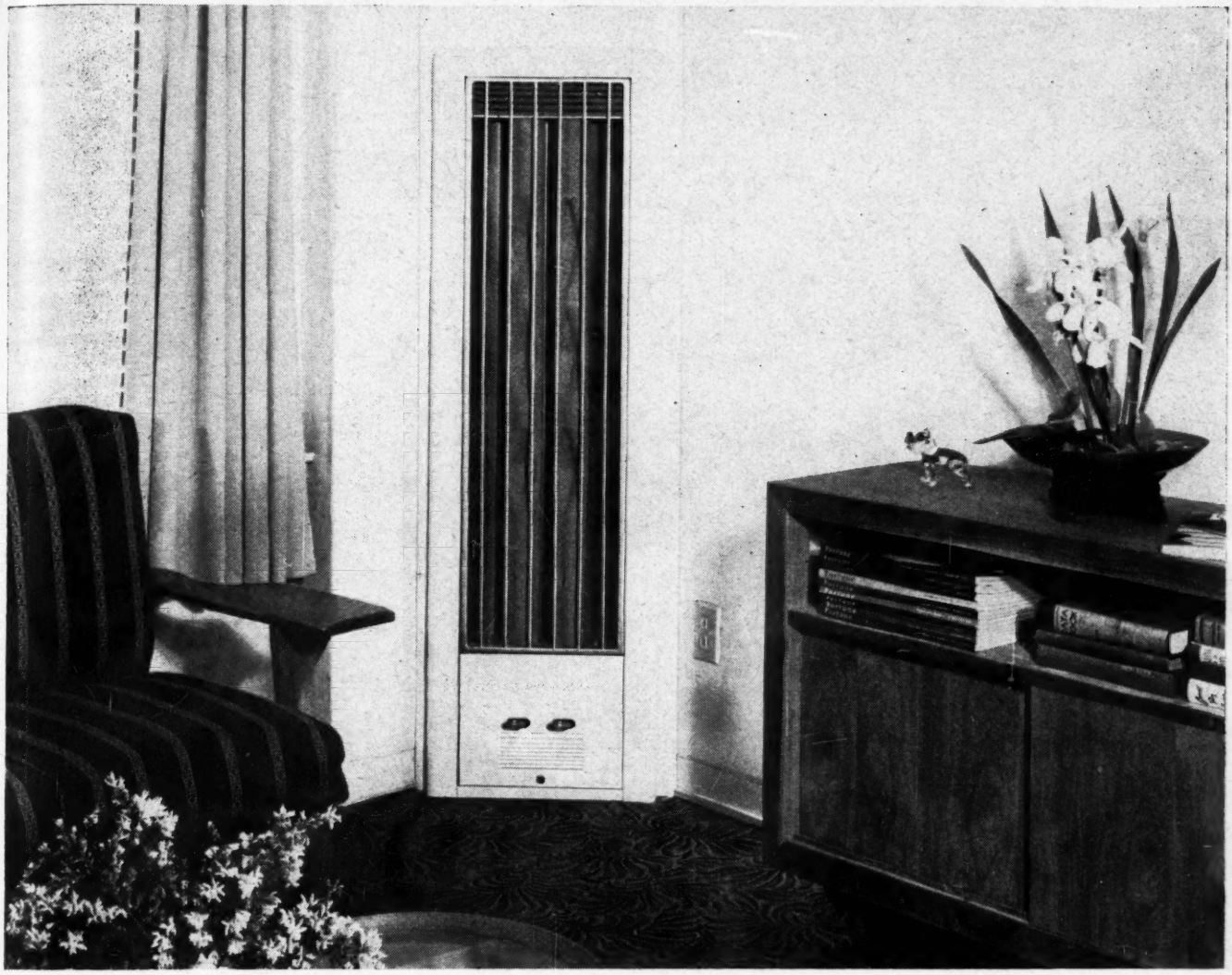
National Fire Protection Association—Boston, June 3-6.

Canadian Gas Association, 39th Annual Convention—Mannoir Richelieu Hotel, Murray Bay, Quebec, June 18-21.

A.G.A. Convention and Exhibit Set for October, 1946

The 1946 annual convention of the American Gas Association will be held in Atlantic City, N. J., the week of Oct. 7. It will be the first full-scale meeting since the war and will include the added attraction of an exhibition of gas appliances and equipment. It will be the first such exhibition in a decade as the last one, sponsored by the Association of Gas Appliance and Equipment Manufacturers, was held in 1936.

IN ANY CORNER OF PRESENT HOMES



It's fast, easy job to install the new PANELRAY gas heater in any corner of any room in homes already built. A readily-adjustable panel is available which is quickly fitted in any corner, accommodating the various ceiling heights of rooms upstairs or down. And so, since PANELRAY can be installed in any wall, as well, home owners will find it more convenient than ever to enjoy PANELRAY radiant infra-red gas heating.

PANELRAY radiates millions of infra-red waves throughout the entire "living zone" of a room. These waves, traveling at lightning speed, give room occupants instant head-to-toe warmth before room air becomes heated. Drafty floors, chilly corners vanish. PANELRAY is completely vented, eliminating sweated windows and room surfaces. The famous Day & Night "Heat Trap" captures more heat to warm you, adding to PANELRAY economy and heating power.

PANELRAY is available in single units of 10,000, 20,000 and 30,000 BTU — and in dual units of 20,000, 30,000 and 40,000 BTU for serving adjacent rooms. Designed for use with any type of gas and for manual or thermostatic automatic operation.

Write for color booklet giving the complete PANELRAY story.

DAY & NIGHT

DAY & NIGHT MANUFACTURING CO.

One of the Dresser Industries

MONROVIA · CALIFORNIA

Natural Gas Replaces Butane-Air at Arcata, Calif.

The Pacific Gas and Electric Co. in November substituted natural gas for butane-air gas in Arcata, Calif. In order to supply the gas, P. G. & E. constructed a 10-mile, 4½-in. wrapped transmission main at a cost of $58,000 to join Arcata with the company's Eureka natural gas system.

The 1040-Btu natural gas originates in the Tompkins Well field about 14 miles south of Eureka, where a discovery well in the Tompkins Hill district was brought in by the Texas Co. in 1937. Between 1937 and 1941, drilling continued and several other wells were brought in, producing natural gas in sufficient quantities to justify its use for large-scale utility service.

In 1941 P. G. and E. changed over Eureka and vicinity from manufactured gas to natural gas. A 14-mile transmission main was laid from the gas field to Eureka. Natural gas distribution had been considered for Arcata at the same time but the outbreak of war and curtailment of construction materials delayed further service extension until now.

Arcata has been supplied with butane-air gas for a number of years by the Coast Counties Gas and Electric Co. In 1941 the P. G. and E. purchased the Arcata butane-air system for $50,000.

Big and Little Inch Lines Sought by Texas Operators

Claude A. Williams, as representative of Roger Lacy of Longview and other Texans who are ready to buy the government's Big and Little Inch pipelines to transport natural gas to the East Coast area, appeared before the Senate Oil Committee on November 17.

The Texas interests, according to Williams, have 45,000 acres of gas reserves, and if only two of the existing wells were turned on full force, could supply 300,000,000 cu. ft. of natural gas which the lines would hold.

The lines cost the government about $135,000,000. Williams believes if they can be bought for $40,000,000 or less his principals could operate them. About $25,000,000 would have to be spent to convert the lines from oil to gas. Under his plan, the Big Inch line would draw natural gas from Carthage, Willow Springs and Harlton fields, and the Little Inch line would take gas from sources ranging from Beaumont to Corpus Christi.

Panhandle to Refund Over $24,000,000

The FPC has accepted new rate schedules filed in October by Panhandle Eastern Pipe Line Co., Chicago, which reduce its interstate wholesale natural gas rates by $5,110,000 in comparison with its gross operating revenues for the test year of 1941. Due to increased volume of sales since 1941, it is estimated that this will effect a reduction of about $9,500,000 from 1944 billings, or about 32%. The new rates were filed in compliance with the Commission's order and opinion of Sept. 23, 1942, upheld by the Supreme court on April 2, 1945, directing Panhandle to reduce its wholesale gas rates by not less than $5,094,384 compared with 1941 revenues.

As the September, 1942, order directed Panhandle to make the reduced rates effective on all bills rendered on and after Nov. 1, 1942, the company will be required to refund to its customers more than $24,000,000, representing the difference between the reduced rates and those the company has continued to charge up to this time. Up to Oct. 1, 1945, Panhandle and its subsidiaries had deposited with the custodian for the U. S. Circuit Court of Appeals $23,647,413 to be refunded to its customers in Indiana, Illinois, Kansas, Michigan, Missouri, Ohio and Texas if the FPC order was upheld by the courts.

Northwestern Utilities Will Spend $4,000,000

Julian Garrett, general manager of Northwestern Utilities, Ltd., Edmonton, Alberta, estimates that his company will spend $4,000,000 by the end of 1949. Half of it will be spent in 1946 in building a natural gas pipeline about 106 miles long to serve the communities of Camrose, Wetaskiwin, Ponoka, Lacombe and Red Deer.

Capital outlay of $2,000,000 has been necessitated during the war years to enlarge company facilities. Expansion has been achieved despite difficulties in obtaining materials. Garrett said the company now sells about 3¼ times as much gas as in 1934, while the number of consumers has increased from 10,673 to 18,500. During the same period, the price of gas has decreased steadily. In 1934, the company received an average rate of 33.9c compared with 24.7c at present.

The company has extensive gas reserves in the Viking and Kinsella fields, adequate to meet demands for many years, and there are indications that other substantial gas reserves exist in northern Alberta.

Rates Cut 1.5 Million For Colorado Consumers

As a result of a new rate schedule adopted by the Colorado Interstate Gas Co. and approved by the Federal Power Commission, natural gas customers of the Public Service Co. of Colorado, Denver, and its subsidiaries (the Cheyenne Light, Fuel and Power Co. and the Pueblo Gas and Fuel Co.) will receive and pass on to residents of Denver, Aurora, Englewood and Littleton a rate reduction amounting to an estimated $1,498,000 yearly. Public Service Co. buys its gas at wholesale from Colorado Interstate.

The new low rate is cut back to May 20, 1942, when the U. S. Circuit Court of Appeals began to impound funds representing the difference between the old retail rates and the new schedule, pending final settlement of a suit involving the pipeline company. The impounded money now aggregates approximately $8,500,000 for the six gas distributing companies affected, of which more than $4,320,000 will be refunded to customers of Public Service Co.

Bryant Heater Establishes New Industrial Division

Bryant Heater Co., Cleveland, announces the establishment of an Industrial Division to handle the development and distribution of gas combustion components for industrial and process equipment. Activity in the division is centered on the development of an improved line of mixers, injectors, burners and specialized items of gas combustion equipment. Initial products are a proportional mixer (Bryant Flomixer); high and low pressure injectors (Hijectors and Lojectors); tunnel burners, combustion blowers, and opentype burners and cages. Basic design work on a number of the new products is nearing completion and volume production of certain parts will be reached by the first of the year.

D. A. Campbell

The Industrial Division is under the direction of Donald A. Campbell, who has specialized in gas and combustion engineering and served with a number of gas and electric companies before joining Bryant in 1944.

California Commission To Consider Texas Pipeline

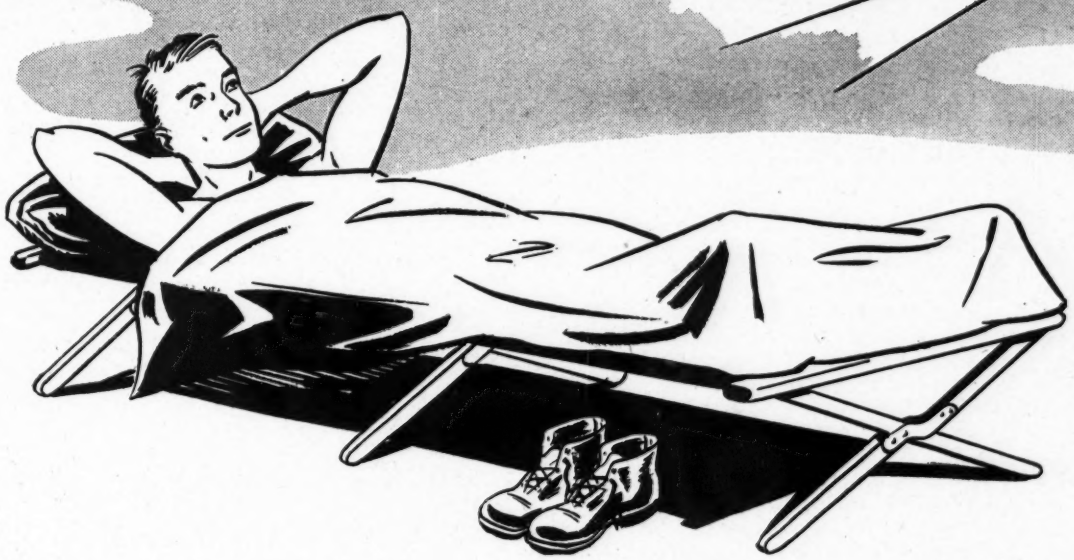
The California Railroad Commission will consider on Dec. 1 the applications of Southern California Gas Co. and Southern Counties Gas Co., asking permission to construct a pipeline from Santa Fe Springs to a point on the California-Arizona border where it will connect with a proposed pipeline bringing gas from the Panhandle-Hugoton and Permian Basin fields in Texas. The latter line, now under consideration by FPC, will be constructed, owned and operated by the El Paso Natural Gas Co., which proposes to build 720 miles of pipeline with necessary compressor facilities, ultimately to supply the California companies with up to 305,000 Mcf per day. If the project is approved by the FPC and the CRC, work will begin not later than Oct. 1, 1946, and the line should be in operation by the winter of 1947.

Michigan Consolidated Announces Rate Reduction

Michigan Consolidated Gas Co. has announced a reduction in natural gas rates for 490,000 customers in the Detroit area, amounting to $3,961,000 annually. The new rates represent a cut of approximately 20% and average annual savings to small domestic consumers will amount to more than $7.

The reduction is the result of litigation started in 1942 through which Michigan Consolidated obtained an FPC order reducing pipeline rates charged for natural gas purchased from Panhandle Eastern Pipe Line Co. Detroit customers will share also in the distribution of $11,000,000 impounded since 1942.

Make those G.I. Dreams Come True!



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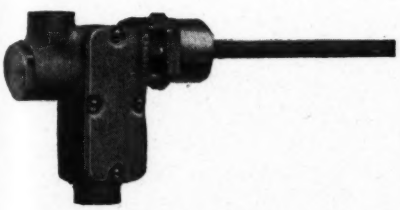
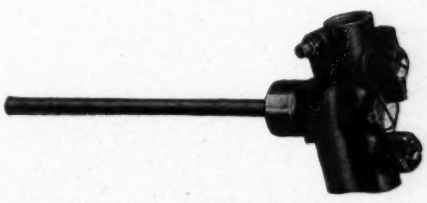
You can promise dependable, trouble free service from the Automatic Hot Water Heater, if it is equipped with



TITAN
WATER HEATER CONTROLS



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PEOPLE

• **Clara A. Ridder** has been appointed home service director of Servel, Inc., **R. J. Canniff,** advertising and sales promotion director, has announced. She succeeds **Frances Cowing** who left Servel earlier this year. Previous to joining Servel, Miss Ridder was executive secretary of the Colorado Nutrition Council in Denver. She formerly served as regional nutritionist for the National Live Stock and Meat Board, instructor in home economics at the New Mexico State College of Agriculture and Mechanic Arts, and as home demonstration agent in Perkins County, Nebraska.

Clara A. Ridder

• The American Radiator & Standard Sanitary Corp. has appointed **Perry M. Gish** assistant general traffic manager, to succeed **Thomas J. McLaughlin,** deceased. Gish started with the company in their Minneapolis office in 1919 and has held various positions with the company in Minneapolis, Buffalo, New York and Pittsburgh. In 1940 he was transferred from New York to the general offices of the company in Pittsburgh where he will remain in his new position.

• **Lawrence C. Jewett,** Arkansas Power & Light Co. auditor for nearly 20 years, has resigned to accept a position in the accounting department of Ebasco Services, Inc. Jewett will be in the Systems and Methods division of Ebasco Services, which is an independent service company with headquarters in New York.

• **Henry M. Taylor** has returned to Ruud Manufacturing Co., makers of automatic gas water heaters, Pittsburgh, Pa., following his recent release from war-time duties with the United States Department of Commerce. Taylor will headquarter in Cedar Rapids as district sales manager.

• The Industrial and Retail Service Division and the Market Studies and Applications Division of the Industrial and Retail Department of the Philadelphia Electric Co. were merged into the Market Studies and Service Division, effective September 11.

Maxwell Cole was appointed manager of the new division and **Charles E. Russell,** assistant manager. Cole was employed by Philadelphia Electric in 1924 as an industrial serviceman. Through a series of promotions he became manager of the Industrial Service Division. Russell has served as industrial heating engineer, supervisor of promotional analysis, director of industrial promotion, and manager of Market Studies and Applications Division.

Brockman's first employment with the Company was in November of 1921 as a transfer clerk. Subsequently he served as order typist clerk, application clerk, assistant cashier, and manager of Credit and Collection department.

Wuest has been with the company since 1926 serving chiefly in relief duties at the various branch offices. In 1940 his work was expanded to include most duties of the Credit department.

• **Florence J. Windecker,** home economics director for the Tappan Stove Co., Mansfield, Ohio, will devote her time to home service activities of the company. Since gas range production began, she has contributed the "woman's viewpoint" at company meetings. She was home economist for the Southern California Gas Co. for 5½ years, and just prior to joining Tappan, was head of the home economics department of Woodbury College, Los Angeles.

• **Edward D. Ayers** has been appointed service engineer for the Pittsburgh Equitable Meter Co. and will represent the firm in eastern New York, operating from the New York City district office under the supervision of **M. J. Harper.**

• **A. J. Strain** has been appointed by Ruud Manufacturing Co., makers of automatic gas water heaters, Pittsburgh, Pa., as general manager of the Toronto plant.

A chemical engineer by profession, Strain has a broad record of accomplishment in the electrical field as well as in the gas business. He worked for several years with The Canadian General Electric Co. on design and sales of all types of heating equipment. He also had an important part in the construction and putting into operation of The Hobbs Manufacturing Co. safety glass plant at London, Ont. Latterly, Strain has been well known in his connection as sales manager of The United Gas & Fuel Co., Hamilton, and until joining The Rudd Co., as superintendent domestic sales, Consumers' Gas Co., Toronto, Ont.

A. J. Strain

Henry M. Taylor has returned to Ruud in the capacity of district manager for the State of Iowa. Taylor filled this same position with Ruud before the war but during wartime was on loan to the United States Department of Commerce.

• **Donald B. Beecher** was elected a director, and vice president and general manager, and appointed chairman of the operating committee of Kentucky-West Virginia Gas Co. at a recent meeting of the board of directors. He will fill the vacancies caused by the retirement of **P. C. Van Gilst** who has served for 28 years with the Standard Gas and Electric System. Beecher began his business career with the Equitable Gas Co. of Pittsburgh in 1926, serving in various capacities. He became assistant to vice president in charge of operation of Kentucky-West Virginia Gas Co. and was operating manager of the company at the time of his promotion. The Kentucky-West Virginia Gas Co. is the major source of natural gas supply for the Philadelphia Co., Pittsburgh, group of gas utilities.

D. B. Beecher

• **Eleanor Morrison** has been appointed home service director of Michigan Consolidated Gas Co. She was formerly supervisor of home economics for the Grand Rapids Board of Education and recently returned from two years of field service with the American Red Cross in India and the Orient.

• **Richard R. Ramsay** of Kenmore, N. Y., has been appointed to the Janitrol space heating sales organization of Surface Combustion Corp., Toledo. Ramsay was a heating sales representative for 12 years with Republic Light, Heat & Power Co. and with American Radiator and Standard Sanitary Manufacturing Co. for two years.

• **A. L. Pollard** has been promoted to General Superintendent of operations for **Puget Sound Power & Light Co.,** Seattle, Washington, according to a recent announcement. Pollard has been associated with Puget Power for 15 years.

Panhandle Eastern Pipe Line Co., Kansas City, Mo., announces four changes in the compressor department. **William F. Farley** has been promoted to chief engineer at Edgerton; **Carl J. Culvert** to assistant chief engineer at Liberal. **Everett D. Stockton** has been transferred from Edgerton to Sneed as chief engineer. **Ray Cheever,** chief engineer at Sneed, has been transferred to Louisburg.

• **Robert C. Allen, Jr.,** has been named manager of the Kansas City factory branch of the General Controls Co., Glendale, Calif. He will serve users of automatic pressure, temperature, and flow controls in Missouri, Kansas, Eastern Nebraska, and Western Idaho. Allen, who was in the army for 3½ years, was formerly manager of the company's Houston and Dallas factory branches.

• **Henry A. Bourne** has been appointed sales manager for Republic Steel Corp. in the Tulsa district. He succeeds the late **Hoyle Jones.**

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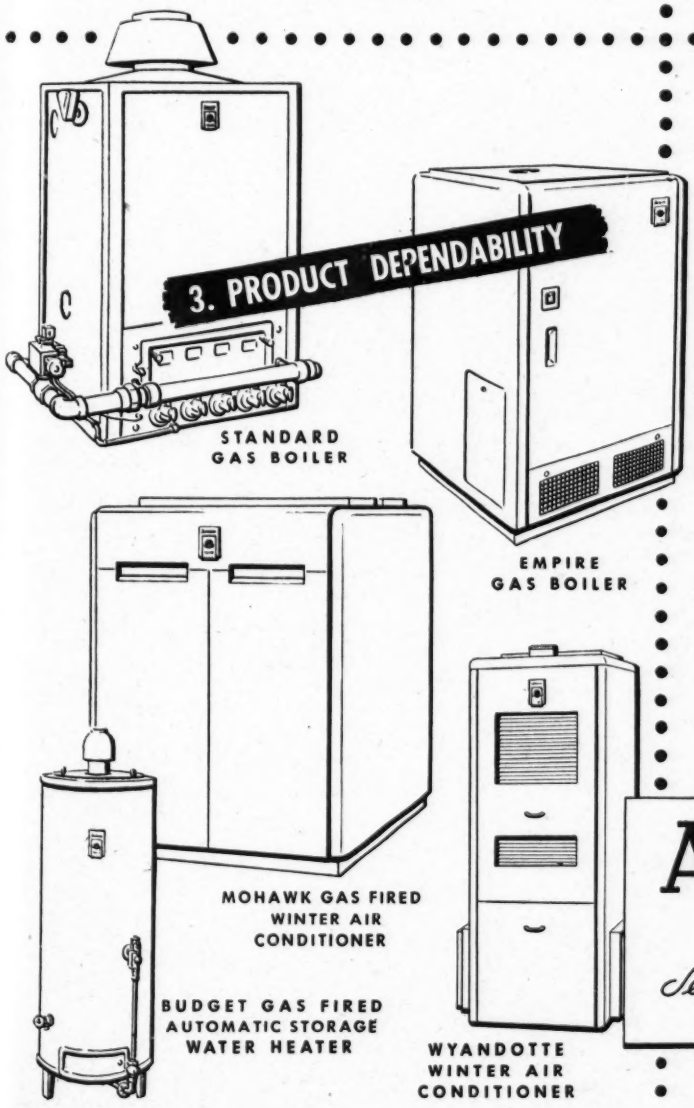
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1. CUSTOMER ACCEPTANCE. No names are better known in gas fired equipment than AMERICAN—for radiator heating . . . and SUNBEAM—for warm air heating. Nationally advertised for more than half a century, they represent quality and long, trouble-free service to your gas customers.

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HEATING PLUMBING

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• **C. H. Gueffroy** has been named a vice president of Portland Gas & Coke Co., Portland, Oregon, to have charge of by - products sales and market investigations, rate and regulatory matters, budgets, financial studies and related activities. Gueffroy has been a member of the organization for 25 years, serving as assistant to the president for the past 12 years. **Paul B. McKee,** president, says Portland Gas & Coke is looking forward to continued growth and development in the gas service field and in the realm of chemical by-products. Gueffroy, with a staff of associates, will pursue particularly the company's opportunities to broaden by-products operations.

C. H. Gueffroy

• **C. H. Zachry,** president of Southern Union Gas Co., Dallas, Texas, has announced that the company's board of directors recently elected **Scott Hughes,** Dallas, vice president, and **Willis L. Lea, Jr.,** Dallas, general attorney.

Hughes, formerly general attorney of the company and for the past three years on leave of absence serving as a major in the Army Air Corps, has been associated with Southern Union 14 years.

Lea has been a member of the company's legal department since 1936, is assistant secretary of Southern Union, and is a member of the Dallas and American Bar Associations.

• **R. M. Deanesley,** recently with M. W. Kellogg Co. and Kellex Corp., has joined the research staff of Universal Oil Products Co., Chicago. He will be in charge of a new department which is being established in the company's Riverside laboratories.

While with the Kellex Corporation, he did important work in connection with the separation of U-235 by gaseous diffusion. This is one of the ways in which atomic bombs were produced.

Born in England and educated at Oxford and at University College, London, Deanesley has had extensive experience in the petroleum industry, especially in th light hydrocarbon field, having been associated with Shell Development Co. for 15 years before joining the Kellogg organization.

• The Dresser Mfg. Division of Dresser Industries has appointed **Hanford Z. Hight** sales manager of the manufacturing division. For the past three years Hight has served with the U. S. Navy as an air combat intelligence officer. Prior to his service with the armed forces, Hight was district manager of Dresser Mfg. Division in the midwest territory.

• **J. M. Schlemmer** has been appointed divisional sales manager of the Refrigeration Division of General Controls Co., Glendale, Calif., **J. F. Ray,** director of sales, announced recently. Schlemmer will contact equipment manufacturers, jobbers and dealers in coordination with the branch office personnel in the use and sale of the refrigeration line of automatic control equipment.

• **Charles A. Reinbolt, Jr.** has joined the American Central Manufacturing Corp., Connersville, Indiana, as sales promotion manager, according to an announcement by **C. Fred Hastings,** general sales manager. He will be concerned particularly with the introduction of the company's new line of American Kitchen steel sinks and cabinets, shortly to go into production.

• **Ernest Martin,** after 43 consecutive years of service with the American Stove Co., retired on pension recently.

Martin is being succeeded by **Ray Ehlert,** who represented the company in the Chicago area prior to the war.

• The Foxboro Co., Foxboro, Mass., announces the appointment of **V. V. St. L. Tivy** as assistant manager, Oil and Gas Industries Sales Division at the home office, and of **Nels A. Swanson,** who joins the company as a sales engineer, attached to the Los Angeles branch office.

• **James E. Pew** was one of 24 key executives who resigned from the Petroleum Administration for War on Nov. 14. In announcing these resignations, **Ralph K. Davies** said the PAW will be virtually liquidated by Dec. 31. Pew has been appointed manager of the new division of natural gas and natural gasoline of Sun Oil Co., Philadelphia. **Charles E. Webber,** who also resigned from PAW, has been appointed assistant manager of the new division of Sun Oil Co.

• **William A. Rhaesa** was made an assistant treasurer of Michigan Consolidated Gas Co. at a recent meeting of the board of directors. Rhaesa has been with the company since 1927, serving in various capacities.

• **Oliver H. Smith** has left Consolidated Edison System Companies to become vice president, general superintendent and engineer of construction, manufacture and distribution of the Brooklyn Borough Gas Co., which serves Coney Island. **Fred B. Cadmus** succeeded Smith as manager of Consolidated Edison's gas production department.

• **Dr. Walter C. Rueckel,** general superintendent of operations, Koppers Co., Inc., Engineering and Construction Division, has been appointed New York district sales manager

• **Lon W. Evans** has been appointed as southwestern district sales manager for the American Central Manufacturing Corp., manufacturer of all-steel kitchen sinks and cabinets.

• **Reid Glover** has been appointed manager of the Ozark office of the Arkansas Western Gas Co., succeeding Elbert Cunningham, who has been transferred to the Rogers office. Glover served with the Seabees during the war but was formerly employed by Arkansas Western.

• **Minor C. Summers,** who resigned his position as accountant for the Arkansas Public Service Commission last June to become treasurer of the Arkansas Western Gas Co., Fayetteville, will return to his former position with the Commission next month, Chairman Charles C. Wine has announced.

• **B. H. Gardner,** of Columbus, Ohio, vice president of the Columbia Engineering Corp., has announced his intention of retiring from active business on Feb. 1, 1946. Gardner spent the first two years after graduation from Clemson College, with the General Electric Co. in Schenectady, N. Y. On Feb. 1, 1906, he entered the employ of the Dayton Power and Light Co. as a power sales engineer.

B. H. Gardner

In 1912 he became sales manager of the Connecticut Light and Power Co., Waterbury. In 1921 he was appointed manager of the Northern Indiana Public Service Co., at Lafayette, and in 1924 was made assistant to the vice president of that company with headquarters in Hammond, Ind. In 1928 he joined the Columbia Gas and Electric System as director of sales, and in 1938 was made a director of the Columbia Engineering Corp. and elected vice president in charge of sales.

• **Robert Munro** has retired after 27 years and nine months service with the B. C. Electric Railway Co. Ltd. He is the man who made the first gas meter in British Columbia. Since that time he has made or repaired thousands more. Munro is a native of Edinburgh and came to Canada in 1905 at the age of 28. He joined the B. C. Electric in 1918 and has been with them in Victoria since that time.

• Cribben and Sexton Co., Chicago, manufacturers of Univesral gas ranges, announces the appointment of **Fred F. Lauer** as Eastern sales manager, **John J. Brandt** as advertising manager, and **Frank E. Brown** as New England district sales representative. Lauer will move to Newark where he will direct sales activities in the New England and Middle Atlantic States.

• Effective Dec. 1, **Ivan W. Patterson** became sales manager for the General Gas Corp. of Baton Rouge. Patterson was formerly assistant collector of revenue of Louisiana.

• **William G. Hamilton, Jr.,** has been promoted from assistant manager to manager of the Philadelphia factory of American Meter Co. He joined American Meter in 1927, engaging in factory production until 1937, when he was advanced to engineering and sales activities, particularly in the fields of pressure regulation, flow measurement and flow control. He became assistant manager in 1941, and during the war he has been in charge of Philadelphia factory operations, including extensive war production for which two "E" awards have been won.

Wm. G. Hamilton, Jr.

• **K. M. Irwin** has been appointed manager of the Engineering department of the Philadelphia Electric and subsidiary companies. Irwin joined The United Gas Improvement Co. organization in 1909 as assistant to the electrical engineer of the Operating and Engineering department. He was subsequently named mechanical engineer of the Engineering Development department and continued in that work until transferred to the Philadelphia Electric Co. in 1931 as assistant to the vice-president in charge of engineering, the position he held at the time of his recent appointment.

• **Thomas N. McCarter,** who helped to organize Public Service Co. of N. J. 42 years ago, retired as chairman Oct. 20. McCarter served as president for 36 years and for the past six years as chairman of the board of directors. He is the donor of the McCarter Medals awarded by the A.G.A. for life saving by application of the prone pressure method of resuscitation.

During his tenure the number of electric meters on the Public Service lines increased from 18,262 in 1903 to more than a million; gas meters from 187,384 at the end of 1903 to more than 900,000; total number of passengers carried on buses and street cars from 215.4 million in 1904 to 667.9 million last year.

• **E. Carl Sorby,** vice president of Geo. D. Roper Corp. has been elected chairman of the "CP" Group of Gas Range Manufacturers of the Association of Gas Appliances & Equipment Manufacturers, **H. Leigh Whitelaw**, managing director of the Association announced recently. **A. B. Ritzenthaler,** vice president of The Tappan Stove Co., was elected vice chairman of the "CP" Group.

Elected to the "CP" Executive Committee were—**Lloyd C. Ginn,** American Stove Co.; **Henry Honer,** Western Stove Co.; **R. S. Agee,** Roberts & Mander Stove Co.; **John C. Pankow,** Detroit-Michigan Stove Co.; **John E. Bogan,** Cribben & Sexton Co.; **H. C. Erhard,** Standard Gas Equipment Corp.; **R. B. Hurt,** Hardwick Stove Co.; and **D. C. Ferguson,** Clare Bros. & Co., Ltd.

• New address for **J. Y. Wheeler,** superintendent of Oklahoma Division of Lone Star Gas Co. is now: 504 Gilbert Bldg., Ardmore, Oklahoma.

Jim Donnelly, former sales manager of SMITHway gas water heaters, has been appointed product supervisor of the entire Water Heater Division of the A. O. Smith Corp., Milwaukee. Donnelly's appointment follows a long association with the water heater, plumbing and heating, and utility fields. **J. E. Woodall,** starting in 1940 as sales manager of the newly-formed home appliance division, resigned from his post Nov. 15 because of ill health. After a rest, he plans to return to Milwaukee where he will devote his time to the expansion of the J. E. Woodall Co., distributors for SMITHway products throughout Wisconsin, Minnesota, upper Michigan, and North and South Dakota.

J. Donnelly

• **Keith B. Miller,** general sales manager of the Tappan Stove Co., Mansfield, Ohio, has announced that eight sales representatives, including two World War II overseas veterans, have returned to their territories.

The two veterans are **Staff Sgt. Charles W. Bonar,** Chicago territory, and **Corp. Karl E. Weller,** southwestern Pa. and northeastern W. Va.

Returning to their pre-war territories are: **J. P. Cole,** Iowa; **E. C. Donnan,** Ill.; **L. D. Crandall,** Kan., and **George M. Yeingst,** northwestern Pa.

Two representatives have been transferred: **R. James Swallen,** formerly in southern Ind., will work with **W. Hubert Tappan,** vice-president, in the southern Calif. territory, and **Ross A. Sams** has been assigned to northeastern Ohio.

• **J. P. Morley,** president of the Bastian-Morley Co., manufacturers of the Crane water heaters and Crane Basmor boilers, distributed nationally by Crane Co., has announced the following changes and additions to company personnel:

Ed J. Carey has become vice president and general manager. He has been with the company 23 years, the past 13 years as West Coast manager; **Ray J. Rodier,** who has been assistant to the president, has been made vice president in charge of manufacturing; **James V. Irvin,** who organized the company's personnel department during the early stages of the war, has been promoted to assistant to the president; **Laurence T. Teglar,** on military leave of absence from the company since 1942, returns to become chief engineer; **Paul H. Mortimer,** assistant to Rodier, comes from Detroit Bevel Gear Co., where he was industrial engineer for the past four years; and **Frank J. Stockhausen,** formerly with the Cordo Chemical Corp., has been appointed to the new position of plastics engineer.

E. Carey

R. J. Rodier

• **Major Harold Johnston** has been appointed superintendent of the Topeka property of The Gas Service Co., Kansas City. Johnston, who has been associated with the company since 1924, was superintendent at St. Joseph, Mo., until called to active duty in June, 1941. During the war he did engineering work at the Topeka Army Air Field, while there he was promoted to major in 1942.

• **Kenneth L. Dynes** has been named factory manager of the Domestic Thermostat Co. and will have charge of production at both of the company's plants according to an announcement issued by President **Wayne Jenkins** and Treasurer **M. M. Kennedy.**

K. L. Dynes

Graduating as an engineer from the University of Illinois in 1924, Dynes attended Carnegie Institute of Technology and there studied additional work in mechanical and electrical engineering.

During the war he was works manager for the electronics division of Aircraft Accessories Corp., Kansas City, Kansas, now known as Aireon Manufacturing Co.

Jenkins and Kennedy previously had been with the Grayson Heat Control, Ltd., at the time Dynes joined that company. The Domestic Thermostat Co. was organized about eight years ago.

Obituaries

• **William G. Roeder,** general office cashier of Westchester Lighting, Mount Vernon, New York, died on Oct. 11. Roeder has been associated with the lighting company for 29 years and had been treasurer of the company's Mutual Aid Society since 1929.

• Dr. Edward Herbert Boomer, 45, chairman of the Alberta Petroleum and Natural Gas Conservation Board and considered Canada's leading authority on the utilization of natural gas, died suddenly at his home in Edmonton on Oct. 27 from a heart attack believed to have been brought on by overwork.

For the past 20 years, Dr. Boomer's research work has been unequalled in developing the oil and natural gas industry in Alberta. In 1930 he originated a simple heat treatment of wasted gas in Alberta whereby benzine was obtained in sufficient quantities for commercial use. At the same time, he also was granted patents on a new process for oxidation of natural gas. During the war he was supervising engineer at Alberta Nitrogen Products, Ltd., whose plant he designed, built and directed for some time. Recently, at the request of the Canadian government, he made a tour of inspection of the German oil industry.

• **John P. Collier,** who for the past 38 years has been connected with the American Radiator & Standard Sanitary Corp. and predecessor companies, passed away suddenly on Nov. 21. Collier was well known in the industry, especially in Chicago and the Midwest. He became assistant to the manager of the company's Chicago branch in 1936, and after the integration of American Radiator and Standard Sanitary in 1939, served in a responsible position in the Chicago sales office.

NEW PRODUCTS

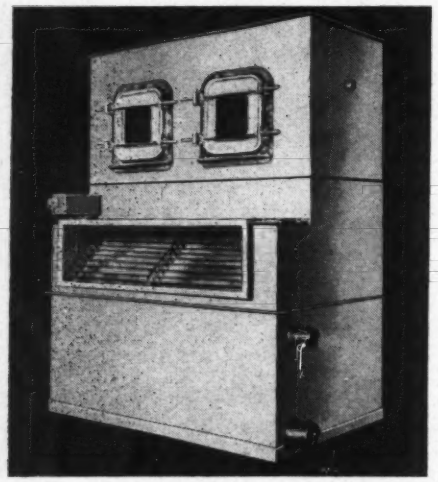
Industrial Air Conditioner

Surface Combustion Corp., Toledo 1, Ohio.

Model: Heavy Duty Kathabar Unit.

Application: Developed especially for larger industrial applications where close control of humidity is necessary to maintain product quality and to insure continuous production.

Description: A vertical contactor of heavy duty construction. Provides a reliable means of dehumidifying-humidifying the air independently of temperature for processing operations and personal comfort. Units are



already in operation in foundries, and in the manufacturing and processing of foods and other items requiring "controlled humidity" atmosphere in quantities from 10,000 cfm to 70,000 cfm. Smaller package units from 1350 cfm to 5000 cfm and large central systems are available. These units have been tested at dew points as low as 80 below zero and utilize a continuous regenerative process making a constant 365-day operation practical.

Internal Combustion Engine Lubricant

Carbide and Carbon Chemicals Corp. (A unit of Union Carbide and Carbon Corp.) 30 East 42nd St., New York 17, N. Y.

Model: A new internal combustion engine lubricant.

Application: There are indications according to the manufacturer, that these lubricants will be widely used in internal combustion engines now that their restriction for critical military use is no longer necessary. These compounds are manufactured in two types, water soluble and water insoluble. The latter type is used for lubricating internal combustion engines. Other applications include lubrication of refrigerating machines and all kinds of machinery operated under conditions of low temperature or where a non-sludging oil is required, and as hydraulic fluids, textile lubricants, plasticizers, in leather treating compounds, wire drawing lubricants and heat transfer liquids. Greases having unusual high and low temperature properties have been prepared from these lubricants.

Description: The manufacturer states that this lubricant has unusual advantages over mineral oil, particularly for cold weather use and has properties quite different in many respects from oils derived from petroleum. This new lubricant contains no petroleum oils. Its use in internal combustion engines has been studied for several years in a large number of vehicles which have covered a total of over one and one-half million road miles.

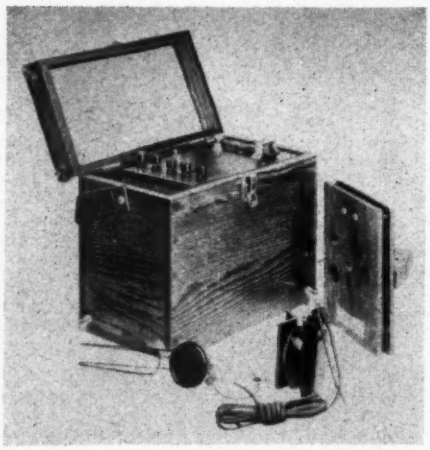
Cable Tester and Locator

W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill.

Model: Stewart Cable Tester and Locator Combined.

Application: Combination of factors for the precise location and depth of buried pipe and cable. To the location of shorts, crosses, grounds, and wet spots the new instrument now adds finding ability. It locates the exact path of cable or pipe to or from buildings; finds position of a water main in street; has a lamp circuit for testing all connections after test has been set up. It is especially valuable for checking depth of cable at river crossings. It determines whether or not a service pipe is below the frost line in lowering or regrading a thoroughfare.

Description: The unit is ruggedly built, easily portable, compactly encased for



rough use and weather. Size: 12½ in. x 7¼ in. x 11 in. high. Weight: approximately 22 lb., including head phones and neutral exploring coil and fish scale exploring coil. Case finished in walnut-brown.

Self-Locking Joint

Norton-McMurray Manufacturing Co., 39 S. LaSalle Street, Chicago 3, Illinois.

Model: Normac Self-Locking Joint.

Application: The purpose in designing this joint was to accomplish what has never been achieved before by the standard type of coupling joint or "slip-coupling" as it is often called.

Description: In this joint have been incorporated practically all the advantages of other similar types, including ease of installation, lack of need for special preparation of pipe ends, and opportunity of angular deflection. Added to this is the unusual feature of locking the pipe in the joint so that it can be laid on top of the ground or any exposed area without anchorage. This locking is performed by the spring type lock ring (small-diameter copper or steel spring ring) which is inserted against the gasket at each end of the coupling. As the

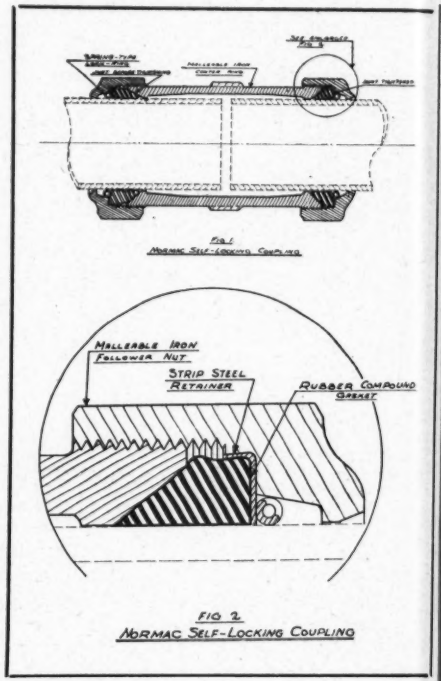


FIG 2
NORMAC SELF-LOCKING COUPLING

gland ends of the coupling are tightened, the lock ring is compressed by a wedging action so as to lock the pipe end and the gland together with a metal-to-metal grip. This assembly is shown in Fig. 1 and 2.

The self-locking joint has withstood an internal pressure of 1800 psi without anchorage. This copper spring ring also serves the additional purpose of insuring metallic and therefore electrical continuity through the joint, in spite of the presence of the rubber gasket, which electrical continuity is necessary when the pipe forms part of an electric circuit in connection with electrolysis bonding or a cathodic protection installation.

Pipe Gripper

J. A. Campbell Co., 645 E. Wardlow Rd., Long Beach 7, Calif.

Model: Nip-Grip.

Application: Holds small pipe in any vice without crushing or marring the surface or the threads.

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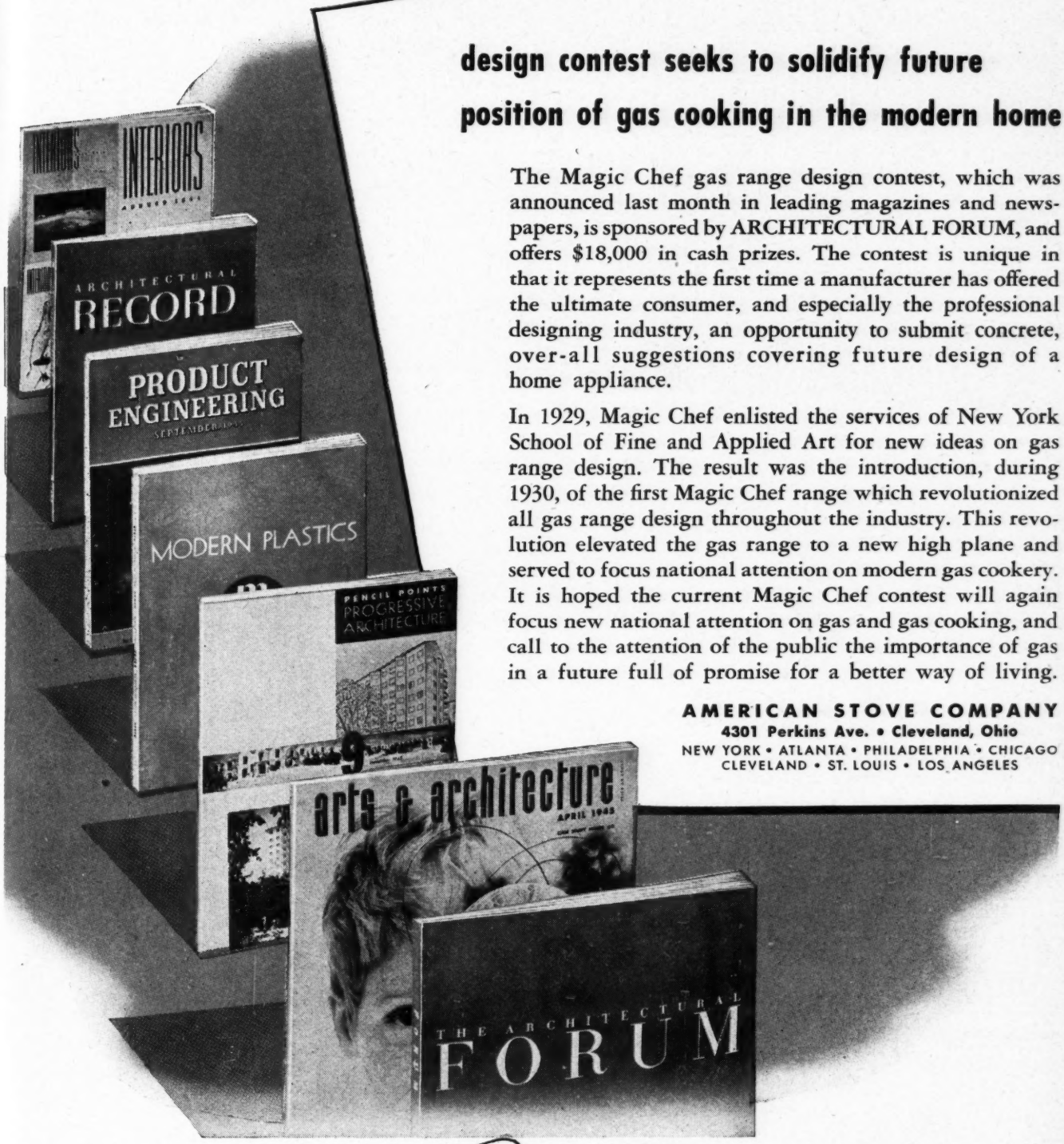


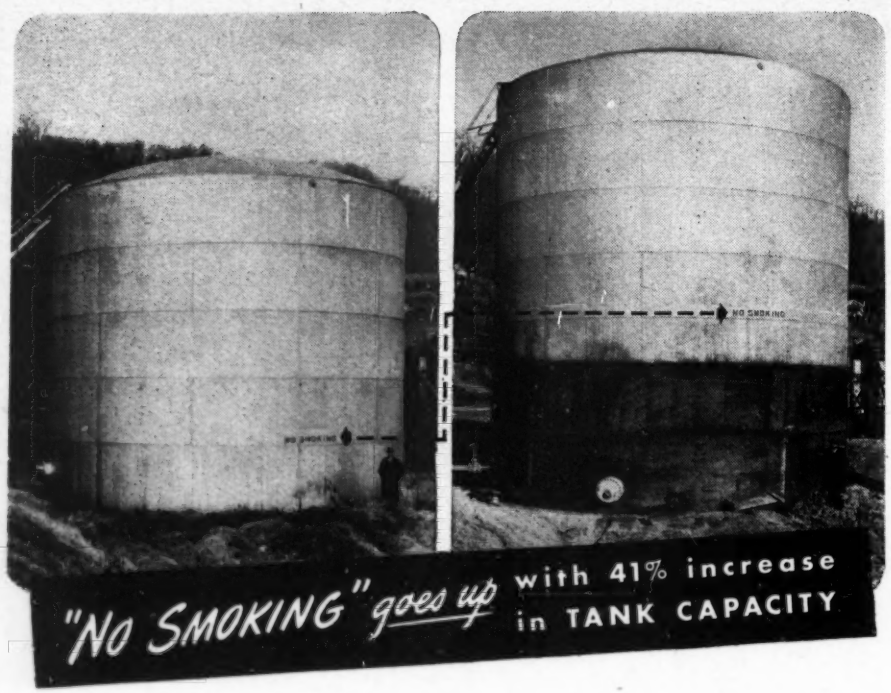
AMERICAN STOVE COMPANY
4301 Perkins Ave. • Cleveland, Ohio
NEW YORK • ATLANTA • PHILADELPHIA • CHICAGO
CLEVELAND • ST. LOUIS • LOS ANGELES

The Symbol of "Certified Performance"

Magic Chef

RED WHEEL GAS RANGES AND HEAVY DUTY GAS COOKING EQUIPMENT

LOOK FOR THE FAMOUS RED WHEEL ... THE MARK OF DEPENDABILITY



Another unusual approach to a common problem by Stacey Brothers

We are fabricators of steel and its alloys and we specialize in the design, production and field erection of high and low-pressure tanks for practically every industry.

If you need additional storage tank capacity, we'll be glad to build you a new tank. But—if your present tanks have umbrella-type roofs or cone type roofs supported from a center pier, it may be far more desirable to increase the capacities of your present tanks by adding new shell sections as shown by the example illustrated above.

Here are the advantages:

- Increased capacity, even though your tank farm has no additional space.
- No costly new piping required.
- Saves money and time since all major parts of your present structures can be used without dismantling.

* * *

A letter addressed to us asking for our detailed pamphlet on "mushrooming" storage tanks will give complete information.

STACEY BROTHERS GAS CONSTRUCTION CO.
One of the Dresser Industries
5535 Vine Street Cincinnati 16, Ohio

Stacey Brothers TANKS

Pressure Controls for Gas and Air

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If you are planning to open a business to serve this market and the billion customers who live in the lands around the great Pacific Basin, investigate the advantages of Northern California. The Pacific Gas and Electric Company will help you in every way possible
Northern California...industrial center of the New Pacific World
PACIFIC GAS AND ELECTRIC COMPANY
P. G. and E. engineers will help you locate your plant
A well-trained Pacific Gas and Electric Company engineering staff has been built solely to help industrial firms learn the facts about locating in Northern California. This staff works closely with established agencies throughout the entire area, and its service includes at no charge...
A thorough study of available sites, photographs, maps, aerial perspectives.
Complete in... on environm... portation, drainage... trucking and freight rates.
Estimated cost of property, of any necessary im... rovements, of power and other utilities.
For more information, or assistance of any kind, write Pacific Gas and Electric Company, San Francisco 6, California.

The Nation's Fastest-Growing Market

—*based on permanent industrial growth!*

Northern California and the West have much to tell and show the Nation. In Northern California, particularly, the spectacular wartime industrial growth has been widespread and diversified. Yet this area has had few war baby industries to impede immediate re-conversion to its postwar economy.

The industrial West and the potential markets surrounding the hub of Northern California are rich in opportunity.

Every community in Northern California has a stake in the busy future that is starting now. Business and industrial leaders in the East have many plans for Western expansion. Pacific Gas and Electric Company is working to help them and to help your community.

NEW PRODUCTS

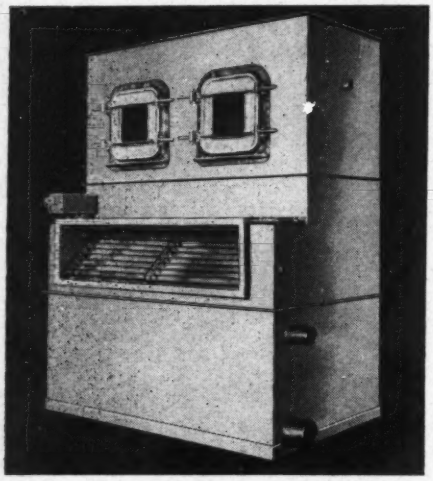
Industrial Air Conditioner

Surface Combustion Corp., Toledo 1, Ohio.

Model: Heavy Duty Kathabar Unit.

Application: Developed especially for larger industrial applications where close control of humidity is necessary to maintain product quality and to insure continuous production.

Description: A vertical contactor of heavy duty construction. Provides a reliable means of dehumidifying-humidifying the air independently of temperature for processing operations and personal comfort. Units are



already in operation in foundries, and in the manufacturing and processing of foods and other items requiring "controlled humidity" atmosphere in quantities from 10,000 cfm to 70,000 cfm. Smaller package units from 1350 cfm to 5000 cfm and large central systems are available. These units have been tested at dew points as low as 80 below zero and utilize a continuous regenerative process making a constant 365-day operation practical.

Internal Combustion Engine Lubricant

Carbide and Carbon Chemicals Corp. (A unit of Union Carbide and Carbon Corp.) 30 East 42nd St., New York 17, N. Y.

Model: A new internal combustion engine lubricant.

Application: There are indications according to the manufacturer, that these lubricants will be widely used in internal combustion engines now that their restriction for critical military use is no longer necessary. These compounds are manufactured in two types, water soluble and water insoluble. The latter type is used for lubricating internal combustion engines. Other applications include lubrication of refrigerating machines and all kinds of machinery operated under conditions of low temperature or where a non-sludging oil is required, and as hydraulic fluids, textile lubricants, plasticizers, in leather treating compounds, wire drawing lubricants and heat transfer liquids. Greases having unusual high and low temperature properties have been prepared from these lubricants.

Description: The manufacturer states that this lubricant has unusual advantages over mineral oil, particularly for cold weather use and has properties quite different in many respects from oils derived from petroleum. This new lubricant contains no petroleum oils. Its use in internal combustion engines has been studied for several years in a large number of vehicles which have covered a total of over one and one-half million road miles.

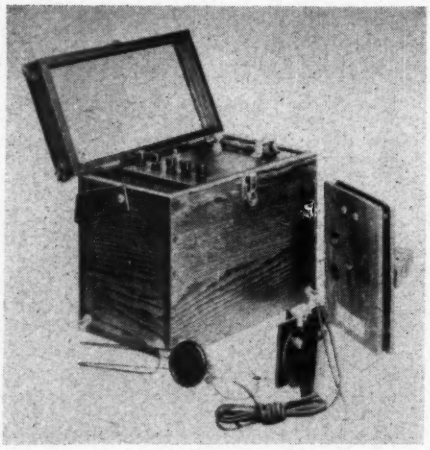
Cable Tester and Locator

W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill.

Model: Stewart Cable Tester and Locator Combined.

Application: Combination of factors for the precise location and depth of buried pipe and cable. To the location of shorts, crosses, grounds, and wet spots the new instrument now adds finding ability. It locates the exact path of cable or pipe to or from buildings; finds position of a water main in street; has a lamp circuit for testing all connections after test has been set up. It is especially valuable for checking depth of cable at river crossings. It determines whether or not a service pipe is below the frost line in lowering or regrading a thoroughfare.

Description: The unit is ruggedly built, easily portable, compactly encased for



rough use and weather. Size: 12½ in. x 7¼ in. x 11 in. high. Weight: approximately 22 lb., including head phones and neutral exploring coil and fish scale exploring coil. Case finished in walnut-brown.

Self-Locking Joint

Norton-McMurray Manufacturing Co., 39 S. LaSalle Street, Chicago 3, Illinois.

Model: Normac Self-Locking Joint.

Application: The purpose in designing this joint was to accomplish what has never been achieved before by the standard type of coupling joint or "slip-coupling" as it is often called.

Description: In this joint have been incorporated practically all the advantages of other similar types, including ease of installation, lack of need for special preparation of pipe ends, and opportunity of angular deflection. Added to this is the unusual feature of locking the pipe in the joint so that it can be laid on top of the ground or any exposed area without anchorage. This locking is performed by the spring type lock ring (small-diameter copper or steel spring ring) which is inserted against the gasket at each end of the coupling. As the

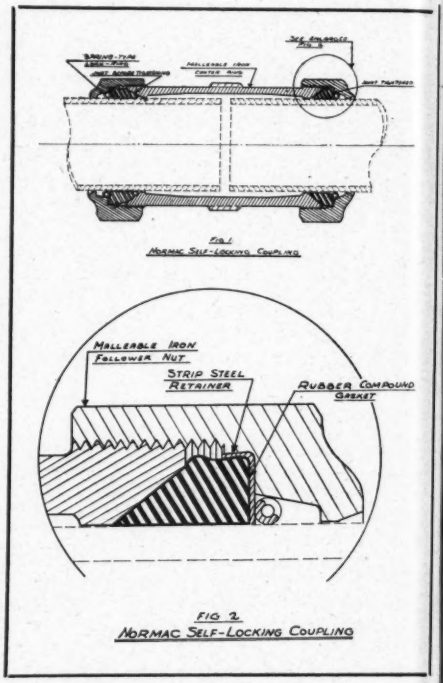


FIG 2
NORMAC SELF-LOCKING COUPLING

gland ends of the coupling are tightened, the lock ring is compressed by a wedging action so as to lock the pipe end and the gland together with a metal-to-metal grip. This assembly is shown in Fig. 1 and 2.

The self-locking joint has withstood an internal pressure of 1800 psi without anchorage. This copper spring ring also serves the additional purpose of insuring metallic and therefore electrical continuity through the joint, in spite of the presence of the rubber gasket, which electrical continuity is necessary when the pipe forms part of an electric circuit in connection with electrolysis bonding or a cathodic protection installation.

Pipe Gripper

J. A. Campbell Co., 645 E. Wardlow Rd., Long Beach 7, Calif.

Model: Nip-Grip.

Application: Holds small pipe in any vice without crushing or marring the surface or the threads.

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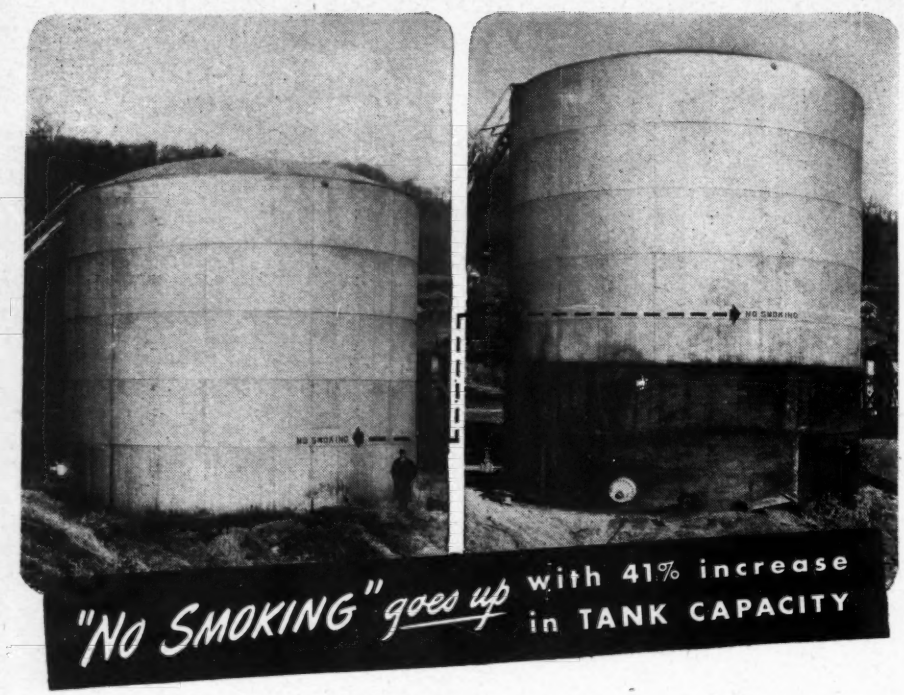

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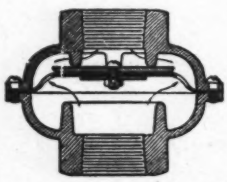
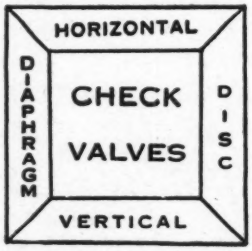
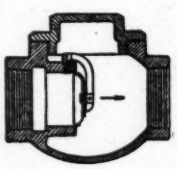
Stacey Brothers TANKS

Pressure Controls for Gas and Air







NORWALK VALVE COMPANY
33 Railroad Ave. South Norwalk, Conn.

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Rochester Hospitalization Plan Saves Workers $2916

During one month 36 Rochester Gas and Electric Corp. employees received a total of 389 days care and saved $2916 on hospital bills through the company's hospitalization service. One employee saved about $426 on two trips to the hospital.

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A thorough study of available sites; photographs, maps, aerial perspectives.
Complete information on environment, transportation, drainage... trucking and freight rates.
Estimated cost of property, of any necessary improvements, of power and other utilities.
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***The advertisement reproduced above, is the second in a series of national advertisements to attract new business and industry to Northern California. This national advertising campaign reaches the more than 5,450,000 readers of*—TIME, SATURDAY EVENING POST, WALL STREET JOURNAL, NEWSWEEK, FORBES and UNITED STATES NEWS.**

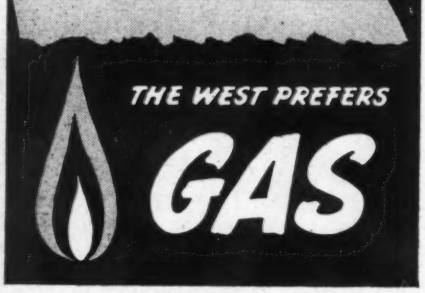
FLASH NEWS OF YOUR ASSOCIATION

Plans for 1946 were reviewed by the P.C.G.A. Cooperative Advertising Committee at a meeting in Los Angeles late in October. It was decided to recommend to member Gas Companies a continuation of the program that has been consistently carried on for 17 consecutive years, in support of gas companies, appliance manufacturers and dealers.

"The Flame Family", gas flame "Quints" who have been featured in domestic advertisements during 1945, will again be in evidence in a new series addressed to home consumers. Full page insertions in color will appear in Sunset Magazine, California Parent-Teacher and California Federation News; black and white versions, in Parent-Teacher Courier and Parent-Teacher Journal.

Trade Journal Advertising will also proceed without interruption in regional media covering eight classifications.

The Committee for the New Year will continue under the chairmanship of Robert R. Gros of P.G.& E., and will include J. S. Spaulding, So. Calif. Gas Co.; Clyde Potter, So. Counties Gas Co.; Forrest Raymond, San Diego G. & E. Co., and R. L. Hayden, Coast Counties G. & E. Co.



CURRENT READING

The Optimum Rate of Production of Oil, Condensate, and Natural Gas—P. J. Jones. "Oil and Gas Journal," Sept. 1, 1945, pp. 50-52. Article 1—Elements of optimum producing rates.

Review of Major U. S. Gas Producing Fields—K. M. Fagin. "Petroleum Engineer," Sept., 1945, pp. 226, etc. About half nation's natural gas reserve of 165 trillion cu. ft. is estimated to be situated in 19 fields.

Soil Corrosion and Pipe Protection—T. H. Gilbert. "California Oil World," 1st Sept issue, 1945, pp. 5, etc. The purpose of this paper is to present a general discussion on the subject of buried pipe lines, their corrosion in the soil, and the various methods employed to shield them from deterioration. An attempt is made to outline in a non-technical manner the general procedures and practices in use at the present time, with as little reference as possible to specific theories or methods. Methods mentioned are not to be construed as the best or only ones available, but rather those that are most typical, most discussed in the literature, or of the most local interest as being used in the Southern California area.

Technique for Determining Installation of Cathodic Units—O. O. Mudd. "Oil and Gas Journal," Sept. 22, 1945, pp. 201, 202. Methods applied for determining the correct distribution of cathodic-unit installations are presented as well as a discussion of policies governing the installation of insulating flanges. Practices described have been developed in a program for corrosion mitigation in which cathodic and galvanic protection units have been progressively installed over the Shell Pipe Line Corp. system until many sections previously requiring excessive maintenance work are now reasonably free from leaks. This program has been steadily carried on since studies of pipe-line corrosion were initiated by the company as early as May, 1933.

Special Measures Employed in Dual Gas-Line River Crossing—A. Spratling. "Oil and Gas Journal," Sept. 22, 1945, pp. 219, etc. A description of the Sacramento River crossing of the Pacific Gas and Electric Co.'s gas line from the Rio Vista field, California.

Two-Way Radiotelephone for Pipe-Line Operation—F. T. Clarke. "Oil and Gas Journal," Sept. 22, 1945, pp. 227, 231, 232.

Partial Combustion of Gas with a Deficiency of Air—F. E. Vandaveer and C. G. Segeler. "Ind. and Engr. Chem.," Sept., 1945, pp. 816-820. For many heating operations the chemical effect of flue products may be disregarded, but for others, such as heat treating and ceramic manufacturing, special care must be given to the composition of the atmosphere surrounding the work. Partial combustion with a deficiency of air has been studied for burning natural, butane, and coke-oven gases with variations of air supply from 10 to 100% of that needed for complete combustion.

Limits have been established below which combustion was not self-supporting. These were 65% of the required air for natural, 60% for butane, and 53% for coke oven gas. By the use of additional external heat, these limits were materially lower. Ratios of carbon monoxide to carbon dioxide and of carbon monoxide to hydrogen have been determined for these gases. The sharp odor which usually accompanies and identifies partially burned fuel gases is generally attributed to aldehydes and other hydroxylated hydrocarbon compounds. Quantitative tests were made for aldehydes, ketones, organic acids, alcohols, and combined nitrogen.

Analytical methods for these compounds in the products of incomplete combustion of gas were not located in the literature. However, the most applicable of the numerous methods for analyses of these compounds were selected and tried. Formaldehyde present up to 0.0842% was the principal constituent. The amounts of other compounds are reported.

Simplification of Gas Flow Calculation by Means of a New Special Slide Rule—B. F. Grizzle. "Petroleum Engineer," Sept., 1945, pp. 154, etc. It is the purpose of this article to discuss empirical gas flow formulae and to select one that will give accurate results throughout a wide range of applicability. In selecting a satisfactory working formula for gas flow, actual metered flow on existing transmission lines has been analyzed and compared with the results of various formulae. As a result of this study, it appears that a formula recently developed by the Panhandle Eastern Pipe Line Co. offers an accurate and practical method of calculation of gas flows for transmission lines.

Zinc Anodes for Preventing Corrosion of Distribution Mains—C. L. Morgan. "Petroleum Engineer," Sept., 1945, pp. 196, etc. The purpose of this paper is to relate experiences with the use of zinc anodes to prevent corrosion to certain steel gas distribution mains. It is not the intention of the author to delve into the theory of cathodic protection; however, an attempt is made to relate from the gas distribution system operator's point of view the need for cathodic protection on steel gas distribution mains, the method employed in application of cathodic protection to mains, and the results obtained. The practical operator, although interested in the theory of cathodic protection, is more concerned with what it will do and how much it will cost.

First U. S. Gas Turbine Demonstrated—J. H. Kunkel. "Petroleum Engineer," Sept., 1945, pp. 98, etc. The turbine discussed in this article is of interest to oil and gas men both because of the type of fuel used and its wide potential application.

ALL OVER AMERICA, people who are building, buying or remodeling a home—or simply replacing war-weary appliances—are reading about Rheem. The advertisement reproduced above is the first of a series of full-page ads running in the Saturday Evening Post.

The advertising tells in a forceful, believable manner why the purchase of any Rheem appliance is a good investment. And that story is going to be told over and over, to a tremendous audience.

With those who know appliances, Rheem equipment has long been a favorite line. It's a complete line—includes automatic water heaters for all fuels, a variety of space heaters, range boilers and tanks, and now, automatic stokers for coal furnaces. Potent consumer advertising will interest a lot of appliance-starved prospects in *Rheem* products. Follow up on this opportunity by writing today, to any of the offices below, for latest information on the Rheem line.

RHEEM MANUFACTURING COMPANY

General Sales Offices New York • San Francisco • Los Angeles • Chicago

6,500 MILES OF GAS MAINS

have been treated with CARBOSEAL Anti-leak

Experience on 6,500 miles of gas mains has shown that treatment with Carboseal Anti-Leak is one of the quickest methods of checking gas leakage. This method saves *labor, gas, money* and *materials;* and the job can be done without tearing up streets or shutting off service.

Leakage reduction of 90 to 100 per cent is usual. Actual tests on joints 11 years after treatment with Carboseal Anti-Leak show that the joints remain tight.

A booklet, "Correcting Leakage in Gas Distribution Systems with Carboseal Anti-Leak," tells more about this treatment—how to apply it, how much it costs, what results can be obtained. Write for a copy.

CARBIDE AND CARBON CHEMICALS CORPORATION
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

"Carboseal" is a registered trade-mark of Carbide and Carbon Chemicals Corporation.

CARBOSEAL *Anti-leak*

GAS METER INDEXES AND FITTINGS

Many Standard Meter Parts Carried in Stock

We will be pleased to submit quotations to your specifications and blueprints.

THE E. F. GRIFFITHS CO.

346 E. Walnut Lane **Philadelphia 44, Penna.**

BOOKS AND PAMPHLETS

The Efficient Use of Fuel—Prepared under the direction of the education sub-committee of the fuel efficiency committee of the Ministry of Fuel and Power, Great Britain, with foreword for the American edition by John C. Olsen, Ph.D., The Polytechnic Institute of Brooklyn. 807 pp. Illustrated. $8.50. Chemical Publishing Co., Inc., 26 Court St., Dept. 44, Brooklyn 2, N. Y.

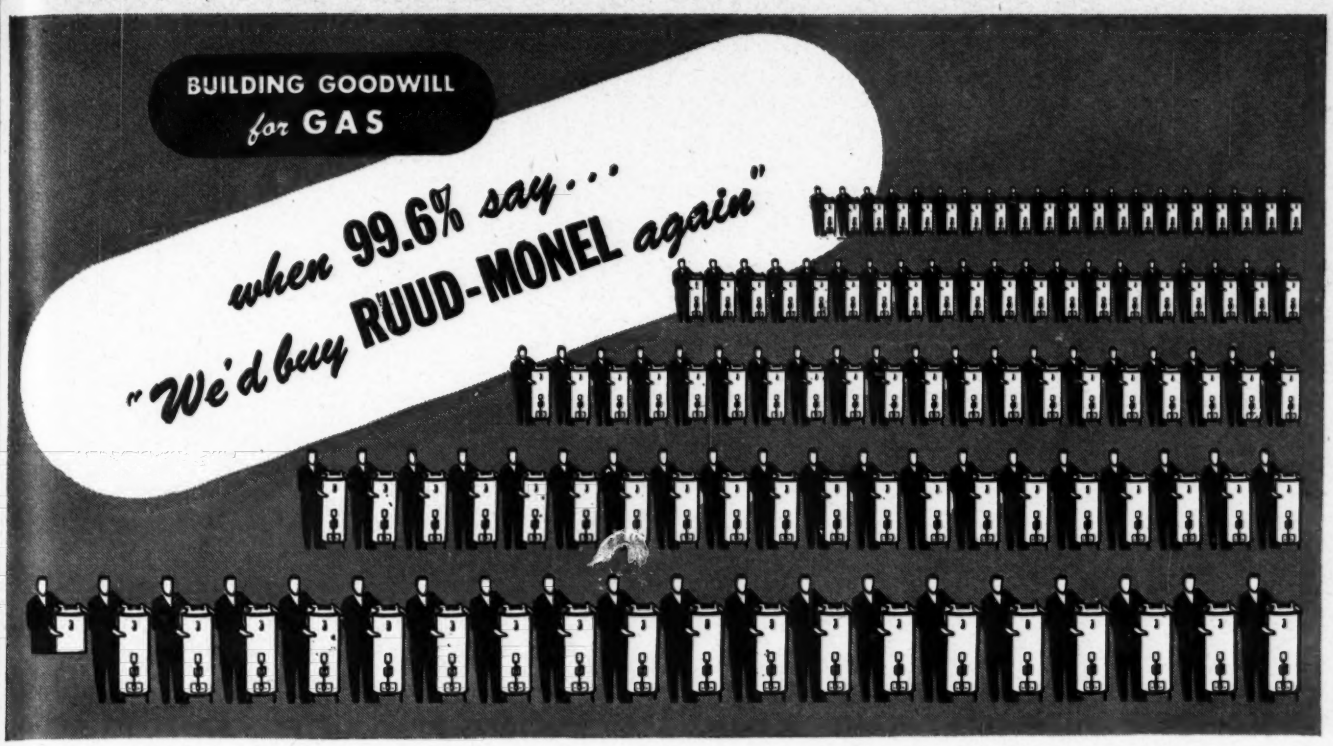
This is an unusually complete text, covering the composition and properties of all types of fuel and explaining the theories and principles of combustion and the equipment used in burning coal and other solid fuel, fuel oil and industrial gases. Boiler efficiency and testing, water purification and auxiliary boiler equipment and boiler settings are fully discussed. The utilization of steam for industrial processes, central heating, drying, evaporation, etc., are described in detail. There are chapters on automatic control, use of necessary instruments, and the sampling and analysis of coal and gases. Every aspect of the economic use of fuel has been given due consideration.

Wartime Changes in Retail Outlets and Sales Volume in California, published by the California State Board of Equalization, Division of Research and Statistics, Sacramento, Calif.

This study was made by the Division of Research and Statistics at the request of and in cooperation with the State Reconstruction and Reemployment Commission. It is one of several made by state departments to furnish data on particular phases of postwar problems in California. Specifically, the main objective of the study was to gather and analyze data and information to assist the Commission in the formulation and promotion of plans for the reemployment of returning veterans and displaced war workers.

According to the booklet, home furnishing stores, including electrical appliances, stoves, refrigerators, and cooking ware, as well as the usual lines of furniture, were increasing in number before Pearl Harbor. The reversal in this trend was abrupt and immediate. The number of outlets declined at the rate of 100 per month from December 1941 to July 1942, when the trend again reversed abruptly. New permits have been exceeding closings by about 90 per month.

Gas Analysis and Testing of Gaseous Materials—V. J. Altieri, B.S., Chief Chemist, Eastern Gas and Fuel Associates, Boston. Sponsored and published by the Technical Section, American Gas Association, 420 Lexington Avenue, New York 17, N.Y. 560 pp. $5.00 to members, $7.50 to non-members. Illustrated. Indexed. The table of contents discloses chapters on kinds of materials, processes, properties and compositions of gases, measurement of quantity and flow, selection of method of sampling, operations and calculations of gas analyses. Other chapters are devoted to specific methods, tests and facilities showing usefulness of gas analyses and testing of materials and processes in the gas phase.



This is *customer acceptance.* Make it work for you.

In a nationwide poll among owners of Ruud Automatic Gas Water Heaters with Monel* Tanks we asked: *If you had to buy a water heater again, would you buy a RUUD-MONEL?*

Of each thousand owners, 996 answered "Yes"!

The chances are, of course, that few of them will ever have to buy another. A Ruud Water Heater with its rust-proof Monel Tank provides perfect hot water service for years and years.

Even so, this overwhelming enthusiasm of RUUD-MONEL owners is significant. First, because it indicates recognition and appreciation of the advantages of having *all* the hot water needed, and of having it instantly at hand at any hour of the day or night.

It's significant, too, as an indication that RUUD-MONEL owners haven't been plagued with service interruptions and maintenance problems.

And—third—it's a measure of their satisfaction with the cleanliness, the convenience and the rock-bottom economy of *GAS.*

So—put this customer acceptance to work. Let the praises of happy RUUD-MONEL owners boost your appliance sales. Let your customers' endorsement to friends and neighbors help maintain the dominant position of *GAS*—the ideal fuel—in the American home.

Sell RUUD-MONEL, the name that thousands know and accept. There's a Ruud Automatic Gas Water Heater with Monel Tank for every domestic use. Write us for full information.

*Reg. U.S. Pat. Off.

RUUD MANUFACTURING COMPANY, PITTSBURGH 1, PA.

H_2OT STUFF

★ Where is the Ruud Automatic Gas Water Heater which has been in daily use for the longest time? Tell us about *your* candidate for long-life honors. But remember: Be sure it's *really* an old-timer. There are many active Ruuds which have passed the 40-year mark.

★ One of the Ruud slogans which has served for many years is:

"A quality line since '89"

That's right! For 56 long years devoted solely to the manufacture of gas water heaters, quality has been the principal objective of the Ruud organization.

★ Another Ruud slogan through the years has been:

"Buy once—buy wisely—buy RUUD"

No dealer—or customer—will ever go wrong by following that simple six-word buying guide.

★ New automatic washing machines will be like autos without gasoline if they're not hooked up to the *right* hot water supply. For these machines require hot water at the correct whiteness-retention TEMPERATURE . . . and in the proper dirt-removing QUANTITY. In short, RUUD-MONEL Hot Water Service, fueled by *GAS!*

★ Making a big hit in commercial and industrial fields is the new Ruud Multi-tube Automatic Gas Water Heater. Nineteen volume water heating sizes. Write for catalog and prices.

RUUD GAS MONEL . . . perfect partners for *Automatic Hot Water Service*

WARREN
LIQUEFIED PETROLEUM GAS

FOR DOMESTIC, COMMERCIAL AND UTILITY USE

Butane and Propane, so valuable to the Allied war effort, will fill an equally important place on the domestic, commercial and utility front in the peacetime years ahead. Proven for a hundred uses — from the production line to 100 Octane aviation gasoline—Liquefied Petroleum Gases have a thousand applications for heat and power, utility gas and other purposes. For a dependable source of supply; for engineering advice and consulting service without obligation, contact the nearest Warren office.

WARREN PETROLEUM CORPORATION
TULSA, OKLAHOMA
Detroit, Michigan — Houston, Texas

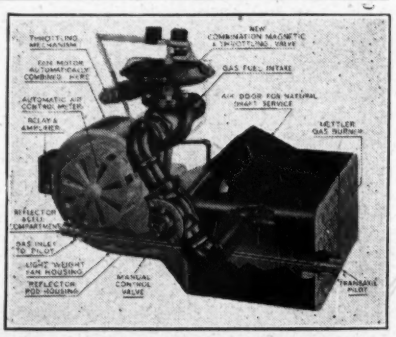
Mettler "FAN-AIR" Gas Burner

Picture reveals essential and highly desirable POINTS of Fan-Air mechanical draft gas burners. Not just a gas burner but a COMPLETE AND FULLY AUTOMATIC BURNER SYSTEM, factory tested and ready for application when received. It's the most modern gas burner and easier to install.

(NOTHING ELSE LIKE IT)

Sizes 5 to 300 H.P. Prompt Shipments

IDEAL FOR SCOTCH MARINE BOILERS



LEE B. METTLER CO.
406 SOUTH MAIN STREET ★ LOS ANGELES 13, CALIFORNIA

PIPELINE NEWS

• Applications of the **Natural Gas Pipeline Co., Texoma Natural Gas Co.** and **Chicago District Pipeline Co.** to construct and operate various pipelines in the Midwest will be considered at an FPC hearing in Washington Dec. 10. The proposed constructions by Natural Gas Pipeline and Texoma, estimated to cost $18,000,000, would enable the two companies, which are operated as one system, to increase their natural gas delivery capacity from the present 268,000,000 cu. ft. a day to 349,000,000 cu. ft. in order to serve a number of Iowa and Illinois communities not now served, as well as to increase deliveries to Chicago District Pipeline Co. The facilities proposed by Chicago District, estimated to cost $1,425,000, will enable it to receive additional quantities of gas from Natural Gas Pipeline Co. Since the second application is contingent upon the granting of the first, the two hearings have been consolidated.

• Construction of a pipeline by the **Arkansas-Oklahoma Gas Co.**, Fort Smith, Ark., to serve the Arkansas Sanitorium at Booneville, Ark., probably will be completed in December Bert Harper, president of the company said.

Conversion of the hospital's heating system from coal to gas was authorized by the Board of Trustees recently and saving of at least $13,600 annually in fuel bills was predicted. Initial expenditure by the state for conversion of the heating plant will be approximately $46,000.

The company will construct 23 miles of line from Vesta, Ark., to the institution. A distribution system for the town of Booneville is included in the project. The Arkansas Public Service Commission has approved the company's application to lay the additional line and install facilities.

• An FPC hearing on application filed by **Tennessee Gas and Transmission Co.**, Houston, was set for Nov. 2 in which Tennessee Gas requested authority to construct and operate additional facilities in Texas including first, 95 miles of 16-in. line extending to their main line with a dehydration plant to be operated in connection with the proposed line which would give an estimated capacity of 99.4 mmcf. per day and, second, 2380 ft. of 8-in. line connecting with **United Gas Pipeline Co.'s** Katy-Satsuma line in order to obtain up to 50 mmcf of natural gas per day from the Katy field for emergency purposes. Total cost of the two projects is estimated at $2,267,732.

• Work was completed Nov. 3 on the 18-mile **Arkansas-Louisiana Gas Co.** pipeline stretching from Daingerfield Morris County, to the Whelan wet gas pool in Northwest Harrison County Texas. Gas company officials said the contractor had not turned the line over to the company, that it had not been tested and no date has been set for the first gas to be run through the carrier. The pipeline ties into Lone Star Steel Co.'s plant and the gas company's pressure station on its main line at Daingerfield.

GAR WOOD GW HEATING EQUIPMENT TRADE MARK

Among the Finer Things to Come . . .

NEW *Gar Wood* AUTOMATIC HEATING UNITS

The future holds definite promise for the new better-than-ever Gar Wood Home Heating Units . . . greater acceptance among home owners . . . easier to sell from every angle. Right now the new gas-fired Tempered-Aire Units are tried and proved, and they will be in production as soon as conditions permit. One of the outstanding improvements in this efficient new unit is the ALL CAST IRON heat exchanger. Look ahead. Plan to sell Gar Wood. Write today for the free booklet "Why You Should Be a Gar Wood Dealer".

This advertisement is an advance description of postwar equipment which is not now available. It does not constitute an offer to sell or deliver and no suggestion is made that orders be solicited. This notice will cease to apply when ceiling prices have been established by the O.P.A.

GAR WOOD INDUSTRIES, INC., HEATING DIVISION

7924 RIOPELLE STREET DETROIT 11, MICHIGAN

Canadian Distributors: Engineering Industries, Ltd., 282 Dupont St., Toronto, Ont.

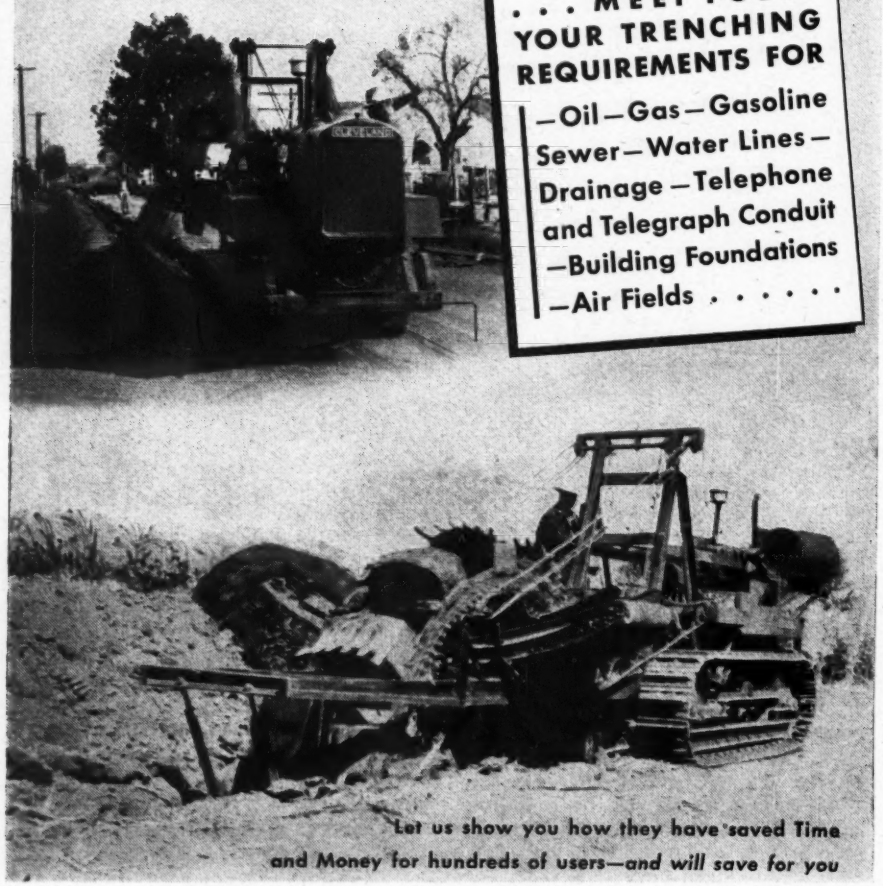
HOISTS and BODIES . . . WINCHES and CRANES . . . TANKS . . . ROAD MACHINERY . . . MOTOR BOATS

Proved by 25 Years Experience On-the-Job—

CLEVELANDS

. . . MEET FULLY YOUR TRENCHING REQUIREMENTS FOR

—Oil—Gas—Gasoline
Sewer—Water Lines—
Drainage—Telephone
and Telegraph Conduit
—Building Foundations
—Air Fields . . . . . .



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THE CLEVELAND TRENCHER COMPANY

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

"CLEVELANDS" Save More . . . Because They Do More

Increased Oil Heating Installations Expected

"Automatic oil heating, with its more than 2.4 million installations, is already America's overwhelming favorite in the automatic heating field," said W. A. Matheson, president of the Oil Heat Institute of America, Inc., before a meeting of the marketing division of the American Petroleum Institute in Chicago last month. Indications point to a total of 4.5 million oil heating installations by the end of the next five years.

This demand—set off by the end of fuel oil rationing—has made itself felt throughout the industry. In September no oil heating equipment manufacturer had less than six months' work on his books and most of them had orders for a year or more. Every order is proof of public faith in an abundance of oil for today and tomorrow, and every oil heating industry plan is geared to this abundance. An industry survey shows that an estimated $900,000,000 worth of oil heating equipment will be installed in American homes in the next five years.

The oil heating industry will employ between 96,000 and 100,000 additional workers in the next year. The manpower demand will include 55,000 in manufacturing, 12,000 in installation and service, 24,000 in delivery of fuel oil, and 5,000 in sales. These figures are exclusive of the men who will be put to work to supply the necessary raw materials and accessories for the oil heating industry.

FPC Accepts New Rate Schedule for PEPL Co.

A new wholesale rate schedule for the Panhandle Eastern Pipeline Co., Chicago, which will result in a refund to the company's wholesale customers of about $24,000,000, was accepted Nov. 7 by the Federal Power Commission. The new schedule is 32% below 1944 billings. It has not been determined whether the reduction will be passed on to retail customers.

Acceptance of the new schedule stems from a Supreme Court decision of last April 2, upholding an FPC order which directed Panhandle to reduce its rates by "not less than $5,094,384" under 1941 rates. Due to increased volume of sales since 1941, the reduction under 1944 rates would amount to about $9,500,000 and total reductions, retroactive to bills of Nov. 1, 1942 and later, will total $24,000,000, FPC said.

Consolidated Plans Underground Storage Farm

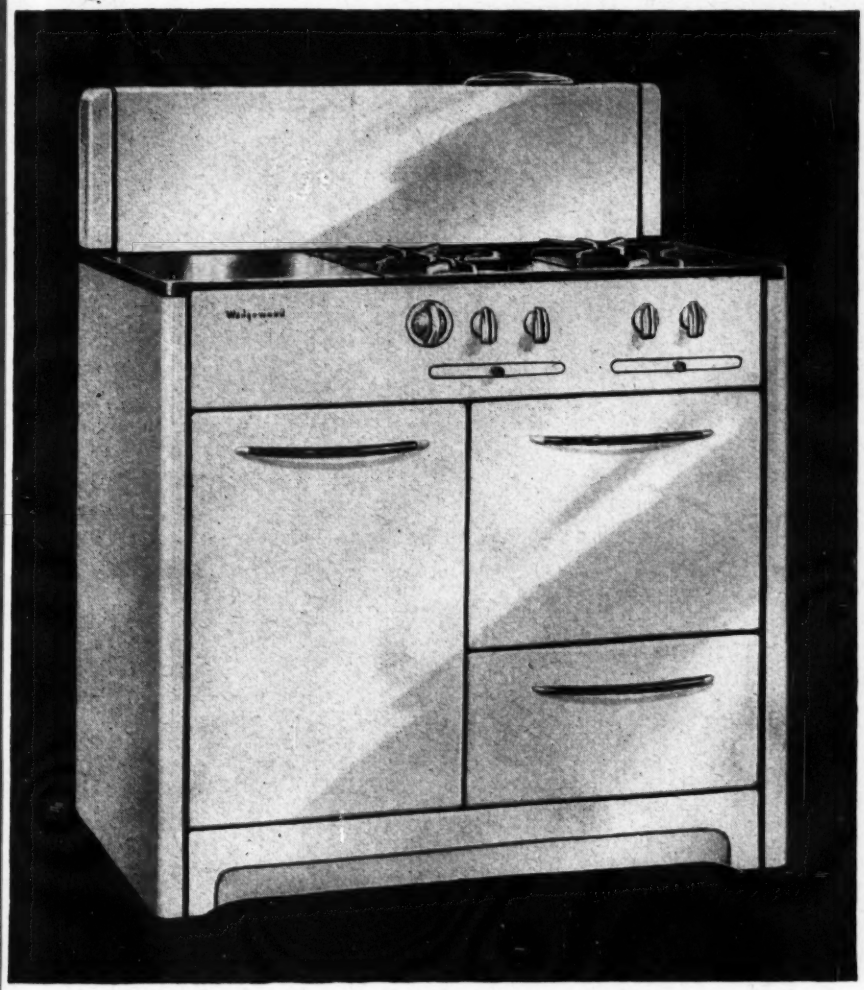
Consolidated Gas Utilities Corp., Oklahoma City, has asked the Federal Power Commission for authority to create an underground natural-gas storage farm on the Sutcliffe structure of 1200 acres in Wilson and Neosho counties, eastern Kansas. The company plans to drill nine injection and withdrawal wells to a depth of 95[illegible] ft., and to construct a pipeline to connect with an 8-in. transmission line. Gas for storage is to be obtained from small wells now connected to the company's lines and from the Cities Service Gas Co.

IT'S LIKE *writing* A LETTER HOME

These ads month after month . . . telling you that all of our production is going to war . . . are simply to remind you that the name to remember when you want real snap-acting gas controls after the war is

SPENCER THERMOSTAT CO. KLIXON ATTLEBORO, MASS.

Her Secret is WEDGEWOOD's



LOW TEMPERATURE OVEN

Assures Perfect Results Always!

● Thousands of women have found in WEDGEWOOD their ideal silent partner in the planning of perfect meals. For WEDGEWOOD'S Low Temperature Oven helps retain the natural juices, the delicious flavor, the delicate tenderness of even the cheaper cuts of meat.

WEDGEWOOD stands for Quality, tested and proven for sixty-three years. Since 1882 the James Graham Mfg. Co. have adhered to this policy: to build the finest, most up-to-date gas range that money can buy. The name WEDGEWOOD on a gas range means ***QUALITY PLUS!***

MODERNS PREFER GAS

WEDGEWOOD THE MODERN GAS RANGE

JAMES GRAHAM MANUFACTURING CO.

LOS ANGELES ★ SAN FRANCISCO ★ NEWARK, CALIFORNIA ★ PORTLAND, OREGON

YOU can cut Transite Flue Pipe right on the job! Its light in weight, goes up readily, needs very little support, requires no paint. Customers stay sold because the job is neat-looking . . . and completely rustproof.

Transite Flue Pipe is made in both round and oval shapes, in sizes to fit all normal requirements. A complete line of fittings and accessories is available.

For complete information write today for booklet TR - 13A. Address: Johns-Manville, 22 East 40th Street, New York 16, New York.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville

TRANSITE FLUE PIPE
For venting gas-burning appliances

Kalamazoo Stove Sets Up Experimental Model Store

A new type of experimental store will be set up by Kalamazoo Stove and Furnace Co. in the recently purchased Bates Building, in the center of Kalamazoo's business district, Kalamazoo, Mich., according to Arthur L. Blakeslee, president.

The store, planned by Jack Morgan, Chicago designer, will serve as an experimental establishment where methods of display, merchandising plans and other phases of retail distribution will be tried out before being installed in retail stores. A model business accounting method — developed within Kalamazoo's own branches during pre-war years—will be set up for study. Display units for large and small stores will be worked out. The model outlet will promote and sell the company's full line of stoves, refrigerators, washing machines, heaters and furnaces.

Model kitchens in basic kitchen types will be built and completely furnished according to a "work center" plan in which storage and work space allotment is broken down to fit kitchen functions. The cooking center, for instance, includes—besides the stove—room for storage of cooking utensils, spices and other staples used in cooking, counter space for filling plates right at the stove.

One floor of the new building will be turned into a sales training school for members of its selling staff, branch managers and franchise dealers. Here a home economist will demonstrate cooking methods in one of the model kitchens.

Lillian Dunbar Heads AGA Home Service Committee

Lillian P. Dunbar has been appointed chairman of the 1946 Home Service Committee of the Residential Gas Section of the American Gas Association by J. J. Quinn, chairman. Mrs. Dunbar joined the Cambridge Gas Light Co. as home service director in 1943, after serving in a similar capacity for six years with the Brockton, Mass., Gas Light Co. She has served as chairman of the New England Gas Association Home Service Group and of the New England Gas Association Educational Committee, was chairman of the recent New England Home Service Development Conference in Boston, has served for three years on the American Gas Association Home Service Committee and has been a member of the New England Gas Association Appliance Study Committee.

Corrosion Engineers to Meet in Kansas City in May

The National Association of Corrosion Engineers has set May 7, 8, and 9 for its 1946 annual meeting and convention at Kansas City, Mo., with headquarters in the President Hotel, according to Elton Sterrett, executive secretary. An exhibition of corrosion-resistant, corrosion-mitigation and various types of protective materials will be shown at the Main Arena of the Municipal Auditorium.

E. HOLLEY POE & ASSOCIATES

SEVENTY PINE STREET

NEW YORK 5, N. Y.

NATURAL GAS CONSULTANTS

W.B.P. Gas Flow Orifice Calculator

How Calculator Operates

To Find Drill Size

1. Rotate movable dial until specific gravity coincides with gas pressure.
2. Rotate movable segment until proper orifice coefficient coincides with desired gas quantity (cu. ft. per hr.). If orifice coefficient is not known, use 0.8.
3. Read drill size on movable dial opposite the arrow (0.8) on the orifice coefficient scale of movable segment.

To Find Cubic Feet Per Hour From B. t. u. Per Hour

1. Rotate movable segment until heating value of gas (B. t. u. per cu. ft.) coincides with gas quantity in thousands of B. t. u. per hour on quantity scale.
2. Read gas quantity in cu. ft. per hour against 1.0 (orifice coefficient scale).

To Find Quantity (Cu. ft. Per Hour) for Given Drill Size

1. Rotate movable dial until specific gravity coincides with gas pressure.
2. Rotate movable segment until arrow (0.8) on the orifice coefficient scale is opposite appropriate drill size.
3. Read quantity (cu. ft. per hr.) against appropriate orifice coefficient. If orifice coefficient is not known, use 0.8.

To Find B. t. u. Per Hour Given Cubic Feet Per Hour

1. Rotate movable segment until 1.0 on the orifice coefficient scale coincides with the gas quantity in cu. ft. per hour.
2. Read corresponding B. t. u. per hour in thousands against appropriate heating value (B. t. u. per cu. ft.).

We pay postage on orders accompanied by remittance. Add 2½% sales tax on California orders.

ORDER TODAY

SPECIAL OFFER
25% Discount on All Orders of 25 or More

$1.00 Each

GAS
1709 West 8th Street
Los Angeles 14, Calif.

Gentlemen: Please send me.....W. B. P. Gas Flow Orifice Calculators, for which I am enclosing check (or money order) for $.....

NAME.....

COMPANY.....

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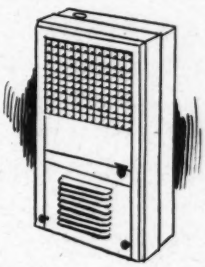
For her Comfort and Safety

Sell

THE NEWEST AND FINEST IN GAS-FIRED VENTED HEATERS. Sell Hammel and you sell satisfied customers. Write today for the sales-making advantages.

Making a sale is easy when you sell any one of the Hammel line of gas heating and ventilating appliances.

The many safety features plus the economical, thorough heating provided by the Hammel line is a satisfaction to the most careful buyer.



It's easy to demonstrate the convenience of operation . . . the safety from open flame and searing heat . . . the fully vented features that go hand in hand with many others to make the Hammel line the outstanding buy. All units carry the AGA seal of approval of course.

Hammel
RADIATOR ENGINEERING CO.
A. S. Martinson & Associates
Successors to Hammel Radiator Corp.
3348 Motor Ave. SINCE 1912 Los Angeles 34

LIKE CARRYING A LABORATORY IN ONE HAND
The ARCCO-ANUBIS PORTABLE GAS BALANCE weighs only 20 pounds complete with carrying case—yet measures specific gravity of gases in the field with laboratory accuracy.
Ruggedly constructed and entirely self-contained, this gas balance will stay accurate in the hardest field service. There is no tinkering—it is easy to operate, easy to read, and no accessories are required. Hundreds in use by major companies.
SEND FOR BULLETIN NO. 101
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RECORDING CHART CO.
3113 E. 11th St. Los Angeles 23, Calif.
SEND FOR COMPLETE LIST OF ARCCO CHARTS

CONNELLY IRON SPONGE

High in efficiency . . . low in cost. In hundreds of plants throughout the country, Connelly Iron Sponge has proven itself . . . the finest purification material on the market. Not only does it lower your purifying cost but its high activity and capacity tends to reduce distribution and service complaints because of the cleaner gas which ultimately lowers operating and maintenance costs.

If you have a problem in gas purification, Connelly's 68 years of experience is at your service. Our engineers can help you . . there is no obligation on your part.

CONNELLY IRON SPONGE & GOVERNOR CO.
Elizabeth, N. J. Los Angeles, Calif.
3154 S. California Ave., Chicago 8, Illinois

Mueller Co. Honored In "Horseless Carriage" Race

The Mueller Co. of Decatur, Illinois, manufacturers of valves and other equipment used by the gas industry, was one of six companies represented on Thanksgiving Day in a re-enactment of the first automobile race ever run in America. This was the 50th anniversary of the 52-mile race which was held Nov. 28, 1895, with an average speed of five miles per hour.

None of the original machines are in existence today. Of the original entrants, only the Mueller Co. and R. H. Macy Co. of New York are still in business. Among the special guests at the race this year was Charles B. King of Larchmont, N. Y., who in the 1896 race, rode as an umpire in the Mueller entry.

A snowstorm occurred on the day of the original race. This made driving difficult, and the driver of the Mueller car wrapped the tires with rope to give them traction. After a gruelling all-day ride in almost unendurable cold, Oscar Mueller, driver of the Mueller machine, lapsed into unconsciousness and King, the umpire, piloted the car the remaining distance to capture second place and $1500. The first award of $2000 went to J. F. Duryea who drove the Duryea Motor Wagon.

International Mart To Open in New Orleans

Manufacturers and suppliers of gas equipment and appliances are reported interested in securing office and display space in the new International Merchandise Mart tentatively scheduled to open in New Orleans in 1946. Sales will be directed primarily to Latin American countries whose officials and business men usually enter this country via the port of New Orleans.

Backed by leading business men of New Orleans and the Mississippi Valley region, this center, to be known as the International Merchandise Mart, Inc., will be a civic non-profit enterprise, the first of its kind in the nation.

The project is now well under way, according to Herbert J. Schwartz, vice president of the Mart Realty Co. The main purpose of the mart is to display and sell to both foreign and domestic buyers many of the things they want, and to provide foreign manufacturers with a show place and sales rooms for their products. Importers, foreign consuls and embassy officials have expressed interest in the project.

FPC Denies Louisville Natural Gas Investigation

The Federal Power Commission has denied a petition filed by Louisville, Ky., requesting FPC to institute an investigation to determine the cost of production and transportation of natural gas sold by Kentucky West Virginia Gas Co. to Louisville Gas and Electric Co., which distributes gas to consumers in Louisville. The petition was dismissed because FPC has no jurisdiction to investigate and determine the cost of production and transportation of the natural gas since it is not transported in interstate commerce.

Saskatchewan Natural Gas Resources to Be Explored

Hon. J. L. Phelps, Saskatchewan Minister of Natural Resources, announces that the Canadian province is studying the possibility of providing natural gas for the cities of Regina, Saskatoon, Moose Jaw and Prince Albert (total pop. 134,533), and will explore the situation fully, particularly if substantial reserves are found to augment the present supply from the Unity field.

Bata Petroleums, Ltd., has drilled 12 wells in the Unity area with a daily capacity from seven producers in the neighborhood of 100,000,000 cu. ft. According to the Natural Resources department, a conservative estimate of the company's proven property amounts to 2600 acres. Bata plans to start work immediately on the drilling of 30 new wells.

Natural gas became available in November to the town of Unity when the Unity Gas and Supply Co. completed construction of a 12-mile pipeline from the field to the town. Phelps said that geologists are checking the Unity field to determine if sufficient supply exists to introduce natural gas to Saskatoon (pop. 43,027). Northern Natural Gas Co. has held a franchise since 1939 to supply Saskatoon with natural gas, and if the field proves adequate, also plans to apply for a franchise to sell natural gas to Moose Jaw (pop. 20,753) in 1947.

Arkansas Western to Sell Water System to Ozark

The Ozark, Ark., city council has authorized purchase of the Ozark water system from the Arkansas Western Gas Co. for $60,000, subject to approval of the Arkansas Public Service Commission. The city will finance the purchase by sale of 4½% income debenture bonds. This is the only water plant owned by Arkansas Western, and operation of its gas distribution system is not affected by the proposed sale.

Equitable Gas Co. Increases Facilities

Since 1940 the addition of new customers in the North Hills, Pa., area north of Pittsburgh, and the decline in the production of gas wells in this section, have made necessary the pumping of considerably larger volumes of gas in order to maintain adequate service. The Equitable Gas Co. is now spending thousands of dollars to increase its distribution facilities in this district, thus assuring an abundant supply of natural gas for the homes now there, as well as for the many new homes to be built.

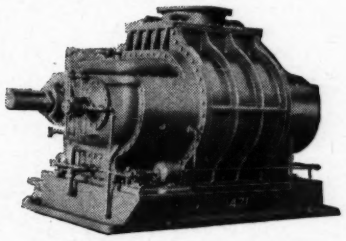
This section of the company's distribution system is located at the extreme northern end of the area served, and the sources of supply are all south of Pittsburgh, making it difficult to maintain the higher pressures required under present operating conditions. The new installation of 15,900 ft. of 16-in. pipe, 2400 ft. of 12-in. pipe, and a new regulator station will provide an ample supply for the future, without necessitating repumping at Weiss Booster Station, which is using all units to handle the present peak load.

PLENTY OF BOOST REQUIRED

• Gas doesn't just flow unaided to your kitchen range or factory burners. To maintain even pressure, it must be boosted along, and that's one of the big jobs for Roots-Connersville gas pumps.

It doesn't make any difference to these positive displacement boosters what the temperature or barometer reading is, or how many BTU's there are in a cubic foot, R-C equipment just pushes the gas, steadily and surely, to give you fuel where and when you want it, for your morning eggs or your manufacturing processes.

So simple is the design and so sturdy the construction of R-C units that many of them have been in profitable service for more years than most men can remember. Some applications are:



Every minute, this heavy-duty R-C unit pumps 15,000 cubic feet of manufactured gas. Equally sturdy and dependable R-C units are available down to 10 CFM capacity.

Proportioning and mixing gases
Acid-making processes
Foundry cupolas
Ore concentrators
Vacuum filtration processes
Paper folding machines
Chemical and food processing
Cooling cannery packs

The continued fine performance of R-C units is the result of our *dual-ability* to engineer and build to the most exacting specifications. If you have a problem of moving air, gas or liquids under moderate pressures, consult us.

ROOTS-CONNERSVILLE BLOWER CORP.
One of the Dresser Industries
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"Homemaker's Digest" Published by Servel

A new magazine, "Homemaker's Digest," has been developed and published by Servel, Inc., and will be distributed exclusively by gas companies to their customers. The magazine is to be published quarterly and will contain material appearing in "Woman's Home Companion," "Good Housekeeping," "Better Homes and Gardens," "McCall's," "Woman's Day," "American Home," "House and Garden," "Parents' Magazine" and "House Beautiful." One million copies of the first issue, which came out on Oct. 15, were printed.

The editors will select the best current features on kitchen planning, kitchen conveniences, cooking, food preparation and care, household short cuts and allied subjects.

Vapor Seals for House Walls

The Bureau of Standards investigation of vapor barriers for walls of houses has been extended to include the possibilities of combining vapor resistance with decorative features in interior finish so as to provide barriers that would be continuously accessible for inspection, and to reduce fire hazards.

Samples of wall papers applied in the conventional manner allowed 1400 grams of moisture per square meter per day to pass through the wall, whereas samples of the same paper applied with a vapor-resistant adhesive reduced the passage of moisture vapor a hundredfold. Samples of wallpapers having a vapor-resistant coating on their faces, and applied in the conventional manner also reduced the passage of moisture vapor a hundredfold.

Unfortunately, no vapor-resistant adhesive or coating has been found that does not disfigure wall paper. Vapor-resistant plastic sheetings, though difficult to apply, were found in other respects to be satisfactory. Paint films and varnishes with and without metal powders were easy to apply but gave variable results. Good aluminum, copper, and other metal foils were in most cases impervious to moisture vapor. Hence, particular attention is being given to the possible use of foil on the interior surfaces as a base for decorative finishes.

Hope to Purchase Gas From Louisiana-Nevada Transit

The Hope Basket Factory, Hope, Ark., has been authorized by the Arkansas Public Service Commission to purchase natural gas from the Louisiana-Nevada Transit Co. of Ada, Okla., which operates a line from Cotton Valley, La., to Okay, Ark. Louisiana-Nevada also supplies gas for the Hope municipal power plant and the town of Bradley.

Laboratories Commemorated

The 20th anniversary of the founding of the American Gas Association testing laboratories was commemorated with a booklet issued last month which described and portrayed the founding and growth of the laboratories.

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A unique method of point-of-sale display has been accomplished by the Seattle (Wash.) Gas Co. This full sized poster mounted on the sales office wall and a miniature reproduction placed in the sales office window have elicited many favorable comments, according to Norbert O. Frath, vice president in charge of sales.

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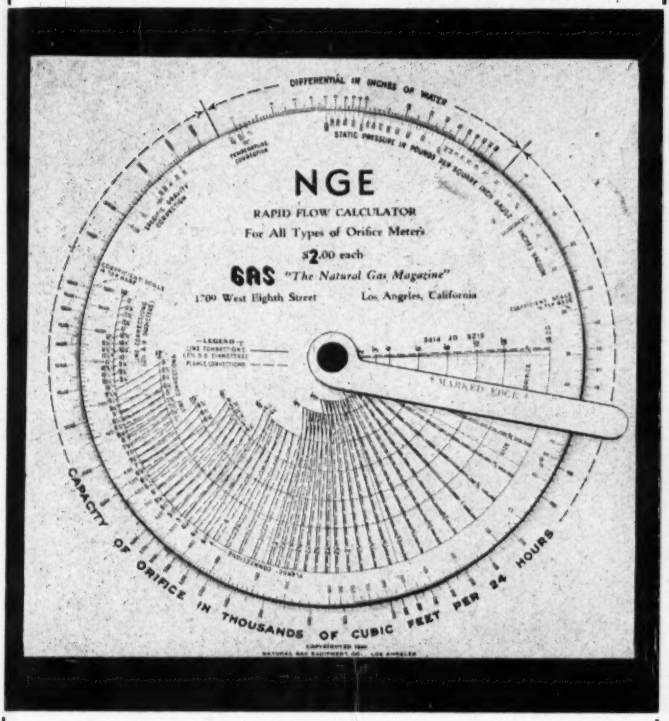
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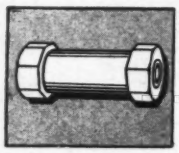

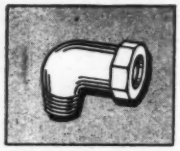

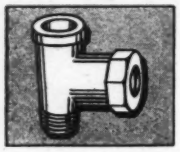

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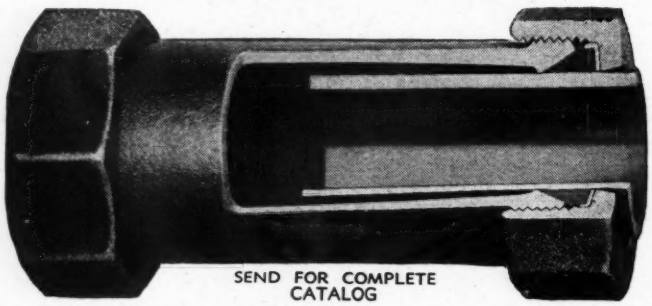

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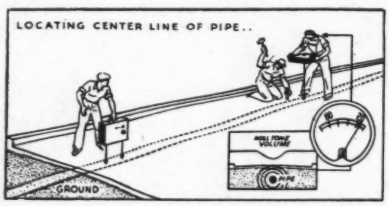

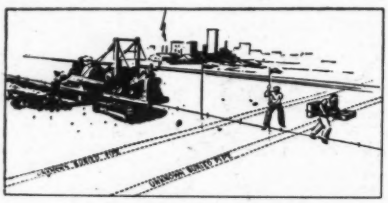

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Studies Planned On Gas Pipeline Equipment

Large scale experimental studies to improve the equipment for natural gas pipelines are now being conducted by the Engineering Experiment Station of the University of Colorado for Stearns-Roger Manufacturing Co. of Denver, designers and manufacturers of processing equipment for the oil and gas industries.

Two 14-ft. high reaction towers are part of the equipment erected last month at the laboratories of the station as the research engineers under Dr. J. E. Stepamek, assistant professor of Chemical Engineering, began assembling the equipment for the projects in an effort to develop improved methods for removing water vapor from natural gas to prevent pipeline freeze-ups.

Pilot plant studies on the efficiency of other types of equipment used in high pressure gas transmission are also planned.

FPC Limits Gas Use For Electrical Generation

FPC has granted the Northern Natural Gas Co., Omaha, permission to continue to sell gas to the Iowa Electric Light and Power Co. over existing facilities for use in its Boone, Iowa, electric generating plant. Such use, however, must continue to be limited to operation of pilot burners, ignition purposes, and as emergency standby in the case of breakdown of coal-handling and coal-burning equipment.

Northern Natural's application sought authority to sell additional gas for use as boiler fuel in the Boone plant, but this was not authorized since the evidence presented clearly showed that the Boone plant can be operated successfully with coal and that the proposed transportation and service of natural gas for this purpose is not required by the present or future public convenience and necessity.

Pacific Gas Workers Accept Wage Increase

The Pacific Gas Workers Union, meeting with representatives of Southern Counties Gas Co., agreed to accept the company's offer of a 15% wage increase to be retroactive to Nov. 1. The union reserved the right to make further adjustments on the basis of a national wage formula if such a formula is established within the unexpired term of the contract.

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